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Macroeconomic Adjustment and Poverty:

The Case of Nicaragua. 1980-1990s

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Macroeconomic Adjustment and Poverty:

The Case of Nicaragua. 1980-1990s

by

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Dissertation

Presented to the Faculty of Graduate School of
The University of Texas at Austin
In Partial Fulfillment of the
Requirements for the
Degree of
Doctor of Philosophy

The University of Texas at Austin

December, 2004

Dedication

I dedicate this dissertation to my mother, who gave me the freedom to be whom I have become. To my father, who shaped my convictions. To my beloved wife Mignone, who has always been a source of strength and a true intellectual partner, and has given me support and encouragement at all times in spite of the sacrifices. To my children Marcel Madero, Pavel Martin, Gabriela Nicole and Mario Sebastian. To my grandmother Laura Román who taught me to aim high. To my grandmother Irma Jacoby who lived to be ninety four. To all the professors and close friends who have been a source of guidance and inspiration, especially Mike, Mario, Jorge, Galio, Armando, Alejandro, Rafael and Eduardo.

Acknowledgments

I like to thank Xavier Gorostiaga, a Jesuit Priest who started me in the research business and provided me with the initial impetus to move towards a doctoral program. Especial thanks go to Dr. Michael Conroy who persuaded me to study in the University of Texas at Austin, and became my mentor and a source of permanent encouragement and support. I like to thank the Ford Foundation for a grant which financed the first part of my doctoral program. The Organization of American States which financed the second part. I also like to thank The University of Texas at Austin and the Department of Economics for providing me with a grant through the years that I was in the UT campus. I like to thank the United Nations Development Program for funding the first part of the research of this dissertation, and for the advise I got from Enrique Ganuza, Lance Taylor and Sam Morley in the poverty decomposition analysis. I like to thank my supervisor Dr. William Glade for his support in the process of writing this dissertation. Without the strong commitment of Dr. Chandler Stolp to keep me focused, this work would not have been possible. I also like to thank the encouraging comments and guidance in modeling through the years of Dr. David Kendrick, and the teachings and support of Dr. Vince Geraci and Dr. Douglas Dacy who were part of my supervisory committee. Finally, I like to acknowledge the support of Mario De Franco and Juan Sebastian Chamorro in the modeling of the computable general equilibrium part.

Macroeconomic Adjustment and Poverty:

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Publication No._____

Mario J. Arana Ph.D.
The University of Texas at Austin, 2004

Supervisor: William Glade

The dissertation explores the relation between macroeconomic policy and performance and its impact on poverty in the case of Nicaragua during the eighties and early nineties. It takes a look at the nature of the various stabilization and adjustment packages adopted, first by the leftist Sandinista Regime, and later by the Chamorro Regime in response to macroeconomic crises. The period analyzed provides a unique opportunity for studying the effect of abrupt and sudden changes in political regimes and macroeconomic policies as the country transited from a centrally planned economy to economic liberalization and market reform.

The dissertation relies on poverty decomposition analysis to look at the evolution of poverty in different sectors of the economy and across social groups, and to study the relationship with macroeconomic policies and performance during the period. The specific characterization of poverty leads to the consideration of

strategic policy options by simulating and comparing the tradeoffs of an orthodox adjustment program with a pro-agricultural based strategy. A stylized computable general equilibrium (CGE) numerical model with two sectors and four social classes is used for this purpose.

The dissertation argues that orthodox adjustment programs, while positive in the medium to long term in terms of economic growth, can potentially harm the poor in the short term. One way to offset this negative impact for the case of Nicaragua is by favoring a more dynamic growth of the rural sector since poverty is concentrated in the rural areas and the country´s tradable goods sector is primarily rural based and agricultural production is labor intensive. However, this must be understood as a temporary policy option as there are distortions in relative prices and potential macroeconomic gaps to take into account in the medium to long term. One way to offset these impacts in the context of a poverty oriented reduction strategy is through a temporary increase in foreign aid in the form of balance of payment support. It is argued that macroeconomic balance of payment support under these circumstances can have a broader impact than the traditional forms of aid that emphasize targeted development projects to help the poor.

Table of Contents

List of Figures

List of Tables

Chapter 1: Introduction

The elimination of widespread poverty and income inequality is at the core of all developmental problems. During the eighties the debt crisis and the subsequent economic adjustment programs in developing countries, especially in Latin America, brought high economic and social costs to these economies which tended to be downplayed by theory and applied analysis. As a result, a renewed interest has emerged in defining the channels of poverty transmission for countries undergoing economic crisis and adjustment processes, and the impact of these programs on the poor.

According to Hartwell,[1] "economics is, in essence, the study of poverty" as the structure, efficiency and growth of production affect - and are affected by - the distribution of consumption. For Lipton and Ravallion,[2] "poverty analysis has three tasks: (i) to define and describe poverty; (ii) to understand its causes and (iii) to inform policy."

The purpose of this dissertation is to shed light on these issues by analyzing the link between the evolution of poverty and macroeconomic policy and performance during processes of economic crisis and adjustment. An adjustment program is a set of policies to restore macroeconomic balance. The dissertation relies on poverty decomposition analysis to determine the level, depth and evolution

[1] Hartwell (1972), p.3.

[2] Lipton and Ravallion (1994), p. 2553

of poverty in different sectors. In particular, the adjustment processes of the eighties and nineties are studied for the Nicaraguan case. Two national household surveys[3] provide the base for time comparisons to analyze the relationship with macroeconomic policy evolution and performance, and determine channels of poverty transmission and the impact on the poor from economic policies adopted during this period.

Abrupt and sudden changes in political regimes and macroeconomic policies in the eighties and nineties in Nicaragua resulted in major physical and human resource transfers from one sector of the economy to another. These processes lead to substantial increases in poverty in both the rural and urban sectors which needed to be reversed. This analysis is presented in Chapter 3.

Chapter 3 and Chapter 4 look at the evolution of household welfare and poverty, in the context of changes in the macroeconomic performance, strategies and policies between 1985 and 1993 in Nicaragua. During that period, Nicaragua underwent repeated attempts to stabilize and adjust the economy to adverse shocks. However, the policies that were adopted in many instances aggravated the impact of these shocks on the poor. Therefore, in order to be able to incorporate anti-poverty policies in adjustment programs a clear understanding of the dynamics of reforms and poverty is needed on a case by case basis as food prices, foreign trade and foreign exchange, public spending and employment variables are all affected.

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[3] INEC (1985), World Bank (1993)

A clear understanding of the channels of poverty transmission and sectors in the case of Nicaragua provides the basis for Chapter 5 which simulates strategic policy options and determines the impact of alternative strategies in terms of income distribution and the welfare of the poor. The policy analysis consists of simulating and comparing the trade-offs of an *orthodox adjustment program* with a *pro-agricultural based strategy.* A dynamic applied general equilibrium model with two sectors and four social classes addresses both of these issues.

A hypothesis of this dissertation is that orthodox adjustment programs, while positive in the medium to long term in terms of economic growth, can potentially harm the poor in the short term. One way to offset this negative impact for the case of Nicaragua is by favoring a more dynamic growth of the rural sector. This is because poverty is concentrated in rural areas in Nicaragua and the country's tradable good sector is primarily rural based and agricultural production is labor intensive. However, this must be understood as a temporary policy option as there are distortions in relative prices and potential macroeconomic gaps to take into account in the medium to long term. One way to offset these impacts in the context of a poverty oriented reduction strategy is through a temporary increase in foreign aid in the form of balance of payment support. It is argued that macroeconomic balance of payment support under these circumstances can have a broader impact than the traditional forms of aid which emphasize targeted development projects to help the poor.

The contribution of this dissertation also is in the use of applied analysis relying on modeling theory such as computable general equilibrium modeling and tools such as poverty decomposition analysis to deal with the macroeconomic impact of adjustment on the poor for the case of Nicaragua and the analysis of strategic policy options.

In Chapter 5, alternative policies and impacts on income distribution and growth are simulated considering the characteristics of poverty in Nicaragua. The applied general equilibrium model has structural features which complement the more traditional neoclassical optimizing behavior of economic agents from general equilibrium economic theory. Among the structural features are the existence of unemployment levels, imperfect substitution of exports and domestic goods and a closure for investment which includes external savings among the most important characteristics.[4]

Before proceeding to present the findings from the empirical work, the second chapter of this dissertation will consist of a literature review of the issues of adjustment, and the transmission mechanisms of economic crisis and poverty. In this context, the chapter will also present an overview of the evolution of development theory and the recent treatment of the poverty issue in Latin America as well as the evolution of poverty policy options.

[4] Devarajan et al., (1994)

Chapter 2: Adjustment, Poverty Analysis, Transmission Mechanisms and Poverty Reduction Policies

Since the debt crisis of the early eighties and the subsequent adjustment programs implemented in Latin America, a debate began to emerge about the ability of adjustment programs to generate economic growth and their impact on the poor. The accumulated evidence indicates that while adjustment is preferable to non-adjustment for better macroeconomic performance,[5] it is much less clear what the impact of adjustment on the poor has been. While some studies have been conducted that provide a better view of the links between macroeconomic policy and the microeconomics at the household level,[6] the emerging conclusion is that the poverty and social impacts of adjustment and economic crisis are hard to predict on the basis of theory alone. This seems to be more an empirical matter.[7]

Similar perspectives are found in the literature of income distribution. For Kanbur (1996), the recent proposition that there are no tradeoffs between growth and equity is still premature. In this view, the tradeoff between growth and equity is ever present and needs to be negotiated by each society in the context of its own socio-political framework. Country case studies, therefore, are recommended

[5] Corbo et al., (1992)

[6] Demery et al., (1993)

[7] Grootaert (1996)

instead of cross country regression analysis to clarify this issue, which is also the recommendation made in the poverty and adjustment literature.[8]

In this context, the practice of incorporating poverty-mitigating policies in adjustment programs began systematically in the second half of the eighties.[9] But starting in 1999 with the International Monetary Fund and the World Bank´s Highly Indebted Poor Countries Initiative, the new adjustment programs for developing countries explicitly incorporated poverty reduction policies. So the analysis of the link between poverty, economic crisis and macroeconomic adjustment policy has to be placed in a broader framework and has gained a new sense of urgency.[10]

Approaches to the Analysis of Poverty and Adjustment

The literature on adjustment and poverty, although small, distinguishes three approaches for analysis purposes. One is qualitative and is based on the analysis of relative price changes on factors using the Stolper-Samuelson theorem from international trade theory. The approach states that in a two-commodity two-factor model an increase in the price of one good will raise the income of the factor more intensively used in its production.

This approach has been adopted by Knight (1976), Addison and Demery

[8] For an evaluation and the prospects of adjustment programs see Weaver (1995)

[9] For a comprehensive review of poverty and policy options see Lipton and Ravallion (1994)

[10] For the new policy proposals from multilateral organizations see World Bank (2000).

(1985), and Ghani (1984), to perceive the effects of devaluation on income distribution. While useful for evaluating possible internal dynamics in an economy, this type of analysis does not provide quantitative estimates of how poverty will change in the process nor does it address the impact of expenditure reduction.

Additionally, there is a class of "meso" level analysis. While they are less ambitious than general equilibrium models, they isolate key links of policy to welfare and they are based on quantitative data. Kanbur (1987a), in his paper "Structural Adjustment, Macroeconomic Adjustment and Poverty: A Methodology for Analysis" provides a framework for the calculation of quantitative estimates of the impact of adjustment on poverty using household income and expenditure surveys.

This work proposes decomposable poverty indices as a way to trace the impact of adjustment on poverty. For this purpose, an index of poverty that is decompasable across sectors is proposed. Foster, Greer and Thorbecke (1984) developed a poverty index that has many of the required properties for decomposition and sensitivity analysis. Kanbur (1987a), Azam et al. (1989) and Demery's et al. (1993) work belong to this tradition. This dissertation relies on this framework for the analysis of Chapter 3.

Another approach for the analysis of adjustment and poverty issues is based on applied general equilibrium modeling. Thus, an alternative approach is an aggregated general equilibrium model of the entire economy that follows in detail

the repercussions of policy changes. De Melo and Robinson (1982), and Dervis, de Melo and Robinson (1982) are examples of this type of work.

A complementary approach is to use direct observations based largely on household level surveys combined with models of alternative policy packages in general equilibrium models. Demery and Demery (1991), Thorbecke (1991), and Bourguignon, et al. (1991 a,b), are examples of this line of work. Household level surveys provide analysis in terms of impact and key parameters. The aggregate models allow for simulations of alternative policy packages.

However, these types of aggregate models often sacrifice realism to be tractable and are at times not even practical, given data constraints and other assumptions that need to be made about economic behavior. In short, these models are only as good as their specifications and the quality of their data. Questions are also raised in terms of the assumptions made for calibration and the basic intuition that can be derived from the interaction of a large number of equations.

Analytic, stylized and applied numerical models are part of the taxonomy of models in this line of work.[11] In Chapter 5 this dissertation relies on a stylized numerical model for the comparison of alternative strategic policy options. Stylized numerical models are more complex than analytical models as wider applicability is desired. While they tend to stay close to their underlying analytical model, the goal

[11] See Devarajan et al., (1994)

is to explore particular causal mechanisms and these models are a good complement to other forms of partial analysis.[12]

The Political Economy of Development Policy and Poverty in Latin American

The dominant theory of development after World War II centered its attention during the decades of the fifties and sixties on the issues of economic growth and capital accumulation as a way to achieve sustainable development in underdeveloped countries. The "trickle down" concept was used to describe how gains in overall and per capita GNP growth would filter down to the masses in terms of job creation and other economic and social opportunities. However, according to this view problems of poverty, unemployment and income distribution were of secondary importance to "getting the growth job done."[13] Development theory at the time emphasized policies that would balance economic and population growth with food production.

The emphasis on economic growth eventually led to questions about the quality of that growth. Therefore, during the seventies, issues of equity and poverty gained predominance. The way these concerns were addressed from a policy perspective was by placing emphasis on the provision of social services in education, health and nutrition. This orientation led to some improvements in those

[12] For a detailed discusión on the taxonomy of CGE models see Robinson (1989)

[13] See Todaro (1994), p. 15.

social indicators. As such, it was thought that those services were not only important in and of themselves, but that their improvement would also bring increases in income especially for the poor.[14]

This approach, however, also proved to have limitations, to the extent that it looked at the problem of poverty as if it was of a sectoral nature, divorced from the need to have a broader economic development policy framework and the fact that multi-sector actions required to be implemented simultaneously.[15] Therefore, at the beginning of the nineties, the Economic Commission for Latin America and the Caribbean (ECLAC), a regional think tank of the United Nations, emphasized the importance of linking social reforms to economic reforms. ECLAC argued that their simultaneous implementation, as opposed to a sequential approach, would have a greater impact.[16] This point of view in general terms epitomized the conclusions reached at the end of the eighties by many key advocates of development policies.

The debt crisis of the eighties led to an intense debate on development policy issues. A number of documents and proposals began to argue in favor of a more integrated socio-economic approach to development, especially after the debt crisis began.[17] The debt crisis also introduced new elements to the discussion, especially

[14] World Bank (1980), p.3.

[15] Banco Interamericano de Desarrollo y Programa de Naciones Unidas para el Desarrollo (BID/PNUD), (1993), p.11.

[16] Comisión Económica para América Latina (CEPAL), (1992).

[17] See PREALC (1987), and Cornia et.al., (1987).

the issue of the cost of adjustment to the poor. At the time The United Nations Children´s Fund (UNICEF) contributed to the revision of policies within the multilateral international financial institutions towards developing countries by calling for the protection of the poor and other vulnerable groups during processes of economic adjustment.

The decade of the eighties, characterized by programs of stabilization and adjustment as a response to the crises of the external sectors of most Latin American countries, in fact brought high social and economic costs to these economies. These programs negatively affected the poor, especially during the economic contracting phase of the adjustment processes.[18] Initially, the response was the implementation of compensating mechanisms, which essentially provided temporary employment and social protection to vulnerable groups. The World Bank started funding programs to protect the poor from the impact of adjustment as a complement to the economic adjustment programs that were supported by the International Monetary Fund in many developing countries.[19]

Eventually, towards the end of the eighties, however, poverty studies, especially within multilateral international financial institutions, also contributed to

[18] For a study on poverty for several Latin American countries in the decade of the eighties see CEPAL (1990).

[19] The book from Cornia, et.al., *Ajuste con Rostro Humano: Protección de los Grupos Vulnerables y Promoción del Crecimiento*, while politically influential was descriptive in nature and provided little empirical analysis that could shade light on causality and impacts and trends at the sectoral level. From an empirical stand point its contribution was rather limited.

the evolution of a broader poverty policy framework that led to a new emphasis on the financial programs being implemented in developing countries by these institutions. There was recognition that social compensation programs and the protection of vulnerable groups, while necessary, were not sufficient. In this context, once again economic growth was considered essential, but only to the extent that it contributed to opening up opportunities to the poor. As such, it was recommended that this growth had to be labor intensive and equity generating. At the same time the simultaneous implementation of greater investment in human capital, especially in primary education and basic health, nutrition and family planning services, was considered an essential element of the poverty agenda.[20] Greater cost efficiency in development programs was sought, and targeting mechanisms started being developed and implemented, especially considering fiscal constraints.

More recently, a number of new concerns have been added to this agenda. The concept of vulnerability of the poor has been broadened to include not only economic, but also social and environmental vulnerability. Increased weight is being given to the importance of issues of governance in the policy development agenda, and in that context, guaranteeing state institutions that are more responsive to the needs and concerns of the poor.[21] Civil society participation and

[20] This agenda was outlined in the World Development Report on Poverty of the World Bank in 1990 (World Bank, 1990b).

[21] For a discussion of this broader agenda see Thomas et al., (2000)

empowerment of the poor are notions that have become mainstream at least within multilateral international financial institutions. The strengthening of the rule of law and strong and independent institutions based on the notions of Douglass North are also at the forefront of the new agenda.[22] These issues are new complements to the previous framework that primarily emphasized access and opportunity for the poor and the economic protection of vulnerable groups.[23]

At the same time, the Enhanced Structural Adjustment Facility (ESAF), the financial facility made available by the International Monetary Fund to poor countries undergoing adjustment programs, was replaced by the Poverty Reduction and Growth Facility (PRGF) after the "Highly Indebted Poor Countries Initiative" was launched by developed nations to help poor and highly indebted countries.[24] While the ESAF emphasized macroeconomic stability and structural reforms, essentially an economic centered agenda, the PRGF included economic growth and structural reforms while also adding investment in human capital, protection of vulnerable groups, governance, equity, environmental, and decentralization issues as part of the policy agenda, with a special emphasis on poverty reduction. The new facility was also a recognition that the previous economic centered agenda was

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[22] For a discussion of the role of institutions and economics see North (1995).

[23] This new agenda is outlined in the World Development Report on Poverty of the World Bank in 2000 (World Bank, 2000).

[24] The initiative promoted by developed nations in 1998 supported debt forgiveness of poor and highly indebted countries in exchange for the protection of poverty related expenditures and fiscal discipline.

insufficient for dealing with the problems of the poorest economies. The new adjustment programs for example, link debt forgiveness in exchange for the protection of poverty oriented expenditures in the budget.

Macroeconomic Crises, Channels of Poverty Transmission and Macroeconomic Sensitive Policies to the Poor

Although policies that address poverty have become more broad and far reaching, the understanding of the impact of macroeconomic crises on the poor, and the policy options that may exist, remains an essential empirical challenge of the antipoverty agenda. This is because the macroeconomic impact on the poor varies from country to country, depending on initial conditions at the time of the adjustment process, the nature of the shock, and the characteristics of the adjustment program. Macroeconomic crises are nevertheless the single most important cause of rapid increases in poverty.[25]

It has been estimated that for every percentage point decline in growth in general, poverty rises by two percentage points.[26] There is also a negative impact on education, nutrition and health to account for, which causes deterioration in the

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[25] For recent studies based on the experience of Latin America in the 1990s see Ganuza, et al., (1998), Lustig (1995), Morley (1995), and Zevallos (1997).

[26] Morley (1994)

human capital of the poor.[27] De Janvry and Saudulet (1999) estimate that declines in per capita income in the eighties in Latin America reversed the reduction of poverty previously achieved during the seventies. Although there is a discussion about the relationship that many analysts have found between declines in growth and increases in poverty,[28] there is no question about the fact that economic crises and downturns have a negative impact on the poor.

The link between macroeconomic policies and poverty, especially in the context of adjustment programs, therefore requires empirical analysis and a good understanding of the interactions between the two. The impact tends to be different, and while certain policies may be optimal for the macroeconomy, they may not be so for the poor.[29] This depends on the country characteristics and the policy package adopted to deal with the crisis, the existence of consumption smoothing mechanisms, the ability to implement a counter-cyclical fiscal policy and the availability of a safety net among other considerations. However, policies during adjustment programs have not paid adequate attention to the impact on poverty. Within this context a new literature is emerging that is trying to address the issue of socially responsible macroeconomics while taking into account the channels of

[27] Many of the ideas presented in this section come from Lustig (2000), who summarizes a number of conclusions and issues about macroeconomic policies and its impact on the poor.

[28] For a study that questions the more than proportional view of the relationship between growth and poverty see Dollar and Kraay (2000).

[29] Studies of alternative stabilization programs using computable general equilibrium models have found different outcomes for the poor. See Bourguignon and Morrison (1992), and de Janvry and Sadoulet (1991).

poverty transmission and the more adequate mix of macroeconomic policies, as the cost of adjustment from a macroeconomic adjustment is being reexamined.[30]

As a result, the first prescription from a macroeconomic standpoint is crises avoidance, and an adequate response as a priority in a social risk management agenda. It is recognized that governments should avoid lax fiscal and monetary policies, overvalued exchange rates, and non-sustainable current account deficits. More recently, through the nineties, countries have been affected by weak banking and financial regulatory systems, and by volatility in international capital flows, settings that call for steps to build investor's confidence. The choice of exchange rate regime and the use of capital controls are controversial issues extensively debated since the late nineties. Proposals include the possibility of having a policy mix to avoid situations of "overkill" based on overly tight monetary and fiscal policies that increase the impact of recessions as economic equilibrium is restored.

At a more specific level, the channels through which households are affected by macroeconomic crises can be traced to the different sources of household income, and to the prices a household faces when purchasing goods and services. The sources of household income are wages, salaries, self-employment incomes, returns of physical assets and the receipt of public transfers[31]. This framework is

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[30] Lustig (2000).

[31] For a discussion of transmission mechanisms see Ferreira et al., (1999) and Lustig and Walton (1999).

used in this dissertation in Chapter 4 to discuss the impacts and channels of transmission from adjustment to the poor.

In this respect, there are five main types of transmission mechanisms that have been identified:

- Changes in relative prices, which change relative wages, employment patterns, and consumption baskets.
- Changes in aggregate labor demand, which can affect employment levels and/or wage rates.
- Changes in the rate of returns on assets, which includes the regressivity of the inflation tax.
- Changes in the level of public transfers, either in cash or in kind.
- Changes in the community environment in terms of public health or public safety.

Chapter 4 will examine in detail the evolution of key economic indicators combined with an analysis of specific macroeconomic policies and poverty indicators for the eighties and nineties in Nicaragua, and also provide insight in terms of the nature of economic growth that the country needs to achieve a significant impact in poverty reduction in future years.

In this context, another working hypothesis of this dissertation is that prescriptive poverty policy has to be concerned not only about economic growth, but the quality of growth and the sectoral nature of that growth in the case of a country such as Nicaragua. The quality of growth and the context where growth occurs affects poverty reduction. The World Bank (1990b) has argued that the labor intensity of growth makes it effective for poverty reduction since labor is the most

important endowment that the poor have.

Datt and Ravallion (1998) also have shown that sector composition is important for poverty reduction as the growth rate in agriculture output per hectare contributes to trends in poverty reduction. The generality of orthodox adjustment programs needs to be complemented with empirical evidence which provides information about the structure and evolution of poverty to develop improved policy alternatives.

In this context, it is relevant to consider Field's[32] characterization of growth models in terms of poverty and equity considerations. According to Fields, among the various growth models one can distinguish "enlarging of the modern sector," "enriching of the modern sector," and "enriching of the rural sector." Of all these, only the last one is unambiguously pro-poor, especially in those cases in which poverty is concentrated in the rural sector.[33]

The next two chapters will analyze the relationship between economic crises, macroeconomic policies and poverty for the case of Nicaragua during the eighties and nineties, relying on decomposition poverty profile analysis based on two national household national surveys. Macroeconomic policies and indicators will be presented and the general impact from policies will be traced in terms of their effect

[32] Fields (1980)

[33] For a discussion of this theme please see Lipton and Ravallion (1994).

on poverty, to give support to the strategic policy simulations of Chapter 5, which analyzes the tradeoffs of an orthodox program and a pro-agricultural based strategy to favor the poor.

Chapter 3: The Effect of Macroeconomic Policies on Poverty in Nicaragua 1985 -1993

This chapter presents a profile of poverty in Nicaragua based on two national household surveys for 1985 and 1993. Methodologically, the analysis relies on Kanbur´s (1987a) work on structural adjustment, macroeconomic adjustment and poverty, which provides a framework for the calculation of quantitative estimates of the impact of adjustment on poverty using household income and expenditure surveys.

Decomposable poverty indices are used to trace the impact of economic crisis and adjustment on the poor. Foster, Greer and Thorbecke (1984) developed poverty indices that have many of the required properties for decomposition and sensitivity analysis, and are the basis of the poverty measurements and decomposition analysis of this chapter.

The first part of this chapter deals with a description of major structural economic developments in Nicaragua during the period under analysis. These include a comparison of the different underlying economic models which characterized economic policies adopted during the eighties and nineties and the impact of these models in the real sector of the economy. The second part of the chapter deals with the evolution of poverty and its structure as well as an analysis of the origin of poverty during the period based on the decomposition methodology adopted. Additionally, trends in income distribution are compared between 1985

and 1993.

Major Economic Developments in Nicaragua 1980s-1990s

During the last two decades the country went through major changes in political and macroeconomic regime which brought growth contraction and hyperinflation in the eighties, and stabilization and stagnation in the first half of the nineties. These changes had a marked impact on the evolution of poverty and income distribution. These events also conditioned the policy options that remained available for the country through the nineties, in particular, the need to continue implementing programs of adjustment and structural reforms in the economy, while trying to reduce poverty and to attain a path towards meaningful sustainable economic growth.

From 1979 forward, Nicaragua faced rapid and drastic transformations in its productive structure as the country faced two major economic and political regime changes, first in 1979 and then again in 1990. The magnitude and the speed of these transformations caused sizeable social dislocations in the productive structure and dramatic transfers of physical and human resources from one sector to another.

In the mid eighties a relative collapse occurred in the agricultural sector. The last part of the eighties through the first half of the nineties also witnessed an abrupt contraction in the public and manufacturing sectors in relative terms that affected urban and rural poverty in different ways as various combinations

of macroeconomic policies were adopted during these years and which led to these results.

Throughout the eighties, fiscal and monetary policies were excessively expansionary as a left-wing government took power and attempted to rapidly transform the existent economic development model in an effort to achieve greater social equity. This brought about inflation and hyperinflation until 1991 when price increases finally were brought under control after repeated and failed attempts to adjust the economy.

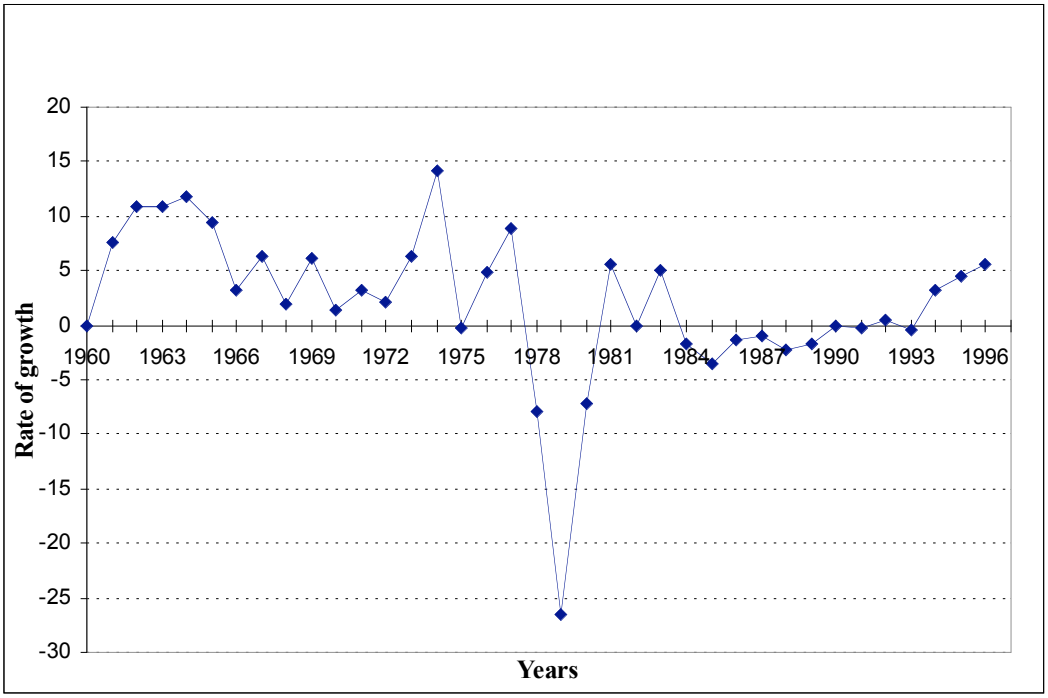
The extremely high rates of inflation in fact, produced a protracted economic contraction, especially of private investment. At the same time, public investments proved highly inefficient and caused crowding out of private investment.[34] The state-centered economic model adopted through the decade of the eighties, the high volatility of economic policy, mixed price signals, and the loss of investors´ confidence all played a role in the contraction of the economy. The productive sectors also underwent major restructuring as a result of changes in relative prices as some prices were managed by the government or suffered controls and others were determined by market forces.

At a more specific level, a set of policies responsible for the collapse of agriculture in the eighties was the enforced management of prices and the rationing

[34] See Arguello et al., (1988)

of basic staples, and key consumer goods. Other shocks included deterioration of external terms of trade and armed conflict in areas of the rural sector which affected especially the production of agricultural basic crops and public investment in the countryside. In addition, all of these shocks and sector collapses would have had a significant impact alone, yet all took place, after a 27 percent decrease in Gross Domestic Product in 1979 when the government changed hands through an armed uprising (Figure 3.1).

Figure 3.1: Economic Rate of Growth 1960-1996



Source: Banco Central de Nicaragua

The disequilibriums and distortions generated during the eighties conditioned the country's policy options and its later economic evolution as the political regime changed once again to a free market system in 1990. Economic

recovery only started in 1994, as Nicaragua was emerging from a state centered accumulation model confronting a post-stabilization phase during the first half of the nineties. As the experience of other countries indicated, even with much less state intervention and lower levels of inflation in the economy, it would take time before economic agents recovered confidence in the sustainability of the new set of economic policies that would reverse the contracting tendencies of the economy. Also, time would be critical to regain a restructuring of the productive sectors consistent once again with the signals of the international market.[35]

Having just gone through a hyperinflationary period followed by the introduction of a relatively orthodox structural adjustment program in 1991, Nicaragua confronted low investment levels, high interest rates, substantial financial margins, an overvalued currency, a "dollarized"[36] economy and in turn economic stagnation. These characteristics were similar to the ones other countries faced in the eighties as they were emerging from high levels of uncertainty and macroeconomic instability.[37]

The reasons behind the stagnation of the economy in Nicaragua during the first part of the nineties, however, were of a different nature than the ones that explained developments in the previous decade. The sharp reduction of fiscal

[35] On theories of growth after adjustment please see Serven and Solimano (1993).

[36] The term is used in this context meaning that most prices were indexed to the dollar.

[37] For a study on stabilization processes in the eighties please see Bruno et al., (1992).

spending needed to control hyperinflation brought increased unemployment especially in urban areas as the public sector contracted. At the same time, the liberalization and opening up of the economy was responsible in large part for the collapse of a manufacturing sector that had been overprotected during the previous decade.

Given this environment, poverty tended to increase in magnitude and severity between 1985 and 1993. The instability itself and the abrupt changes in the productive structure that followed in the wake of internal and external shocks, as well as economic mismanagement, caused the economy to contract. This led to a deterioration of Nicaraguans´ living standards at first primarily in the rural sector, but later also in the urban sector.

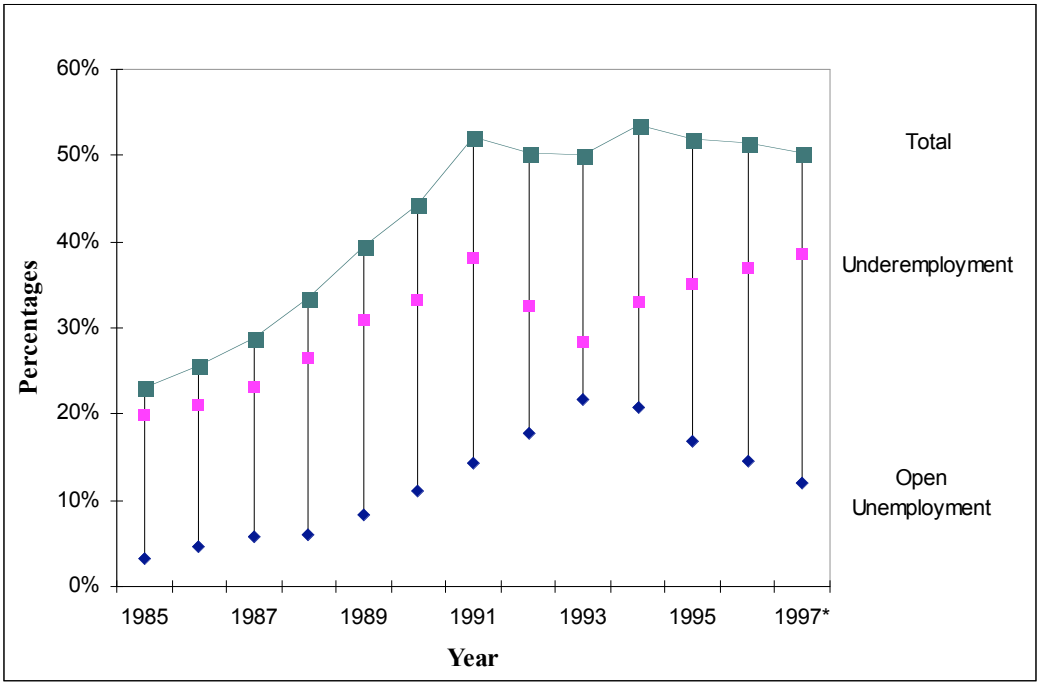
According to the Living Standard Measurement Survey (LSMS) of 1993, poverty was centered fundamentally in the rural sector. [38] By 1993, 88 percent of the rural population was poor according to the established poverty line of US $60 a month per head of household used in this dissertation.[39] In the period under analysis, poverty moved from being concentrated in the western region of the country in 1985, to extend to the war zones, the north, center and Nueva Segovia by 1993. Although poverty in general increased from 42.8 percent to 68.3 percent between 1985 and 1993 and the rural sector had the largest share of the poor, the

[38] The national data bases are the Socio-Demographic Survey of 1985, and the Living Standard Measurement Survey of 1993.

[39] The poverty line was chosen to allow for international comparisons.

most rapid increase occurred in the urban sector, (by place of residence), particularly in the capital city of Managua.

Figure 3.2: Open Unemployment and Underemployment of the Labor Force 1985-1997



The general economic contraction caused a rise in open unemployment to unprecedented levels throughout the eighties and especially the nineties, reaching 18 percent of the economically active population at its highest point in 1993. An even more serious problem in the Nicaraguan case was the level of total underemployment, which affected around 50 percent of the economically active population in the first half of the nineties.

Historical Background of the Economic and Social Model

After the foreign debt crises which began in Mexico in 1982, most countries in Latin America adopted orthodox adjustment programs supported by the International Monetary Fund and the World Bank. These adjustment programs emphasized fiscal and monetary discipline, structural reforms, liberalization and opening up of their economies to make them more competitive in the international market. The model they abandoned was the one that had been promoted by the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) since World War II. This model was based on expansionary fiscal policies, industrialization through import substitution, protection of infant industries and selective use of subsidies, especially in favor of urban consumers.

In this context, Nicaragua presents a particular series of characteristics that differentiate it from the evolution of other Central and South American countries in the eighties and nineties. Unlike the rest of the region, particularly Central America, in which the crisis of the economic model led to structural adjustments and processes of opening and liberalization since the early eighties, such an orthodox structural adjustment process was postponed until 1991 in Nicaragua's case.

Another significant difference from a monetary and fiscal perspective was that Nicaragua, along with most of the Central American countries, had adopted an extremely conservative economic policy all through the sixties and seventies,

combined with a strategy of industrialization through import substitution. Yet unlike other Latin American countries Nicaragua in this period strictly adhered to the monetary approach to the balance of payments, a policy which gave an extraordinary economic stability to the country accompanied by healthy economic growth. The flaw in the model was in its political and social sustainability.

In this respect, Nicaragua did not suffer the inflationary and hyperinflationary problems typical of many Latin American countries during that period, but it shared the inefficiencies and lack of competitiveness of the model of industrialization through import substitution. On the other hand, the economic model depended heavily on the performance of agro-exports for the generation of foreign exchange.

In the early eighties however, with the leftist "Sandinista Revolution" that took power in 1979, Nicaragua adopted an expansive structural adjustment program, abandoning the previous emphasis on fiscal and financial discipline, while adopting and deepening policies typical of the ECLAC model.[40] This model implied seeking growth based on expanded public spending, especially through state investments in productive activities. The economic policy framework included a system of controlled prices that ensured cheap food for the urban population and low prices for imported capital goods and inputs through an artificial appreciation of the exchange rate. The trade policy was protective of local industry, with the aim of

[40] In 1979, an armed uprising deposed the Somoza family dynasty that had had run the country for the previous forty years.

substituting imported consumer goods, especially in the most important categories such as foodstuffs, textiles, alcoholic and non-alcoholic beverages and tobacco. The last three categories were also important sources of fiscal revenues.

Public investment sought to transform the country's productive structure from one heavily dependent on agro-exports to one based on agro-industrial activities geared to exports and energy projects with the objective of substituting petroleum imports. This strategy was sustained not by domestic savings but by external savings, which entailed another form of vulnerability to external shocks that the previous model did not have to a large extent.[41] Thus, while the previous economic model depended on foreign exchange earnings from agro-exports mainly subject to price shocks, the new model depended on the availability of foreign cooperation.

In the context of the confrontation -- which some saw as East-West and others as North-South -- that engulfed Nicaragua after the leftist revolution headed by the Sandinista government got underway in 1979, the country shifted more and more of its dependence on cooperation to the bloc of Eastern European socialist countries and to the Nordic countries. Partly as a result of pressures by the U.S. government, which opposed the Sandinista regime, and partly due to its own

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[41] For an analysis of this aspect see Arana et al., (1987)

decision, Nicaragua was thus isolated from the influence of the international financial institutions that were supporting adjustment programs in the region.

The lack of policy conditionalities from multilateral financial institutions plus high military spending accounted for the large fiscal deficits which characterized the greater part of the Sandinista government in the eighties. Political considerations and misguided economic policy decisions led the country into the most prolonged period of hyperinflation in modern history, including some of the highest rates in the world, as a result of macroeconomic imbalances.

The growing inflation which started in the mid eighties, which would later turn into hyperinflation, produced a series of distortions in the economy as economic policy relied on controlling basic macro prices such as the interest rate, the exchange rate, the price of fuel and oil-related products and basic goods. An important part of the economy, however, was led by market forces. Macroeconomic policy in this sense was left behind and lost step with the market. This approach also led to a deliberate isolation from the international market and its pricing system, especially through the cumbersome implementation of multiple exchange rates. The distortions in the system of relative prices turned the economy inward looking, which contradicted the stated objectives of government policy.

In this context, the restructuring of the productive sectors in the eighties was based on state led top-down approach which relied on selective policy alternatives often at odds with market signals. This meant that no macroeconomic analysis

of the period could be done in strictly conventional terms. It was not until the end of the eighties and during the nineties that traditional macroeconomic policy instruments and market price signals again regained relevance.

Structure of the economic model: The country's economic productive structure during the eighties experienced important changes. As shown in Table 3.1, the share of the total economy due to agriculture fell from an average of 24 percent between 1960 and 1980 to 18 percent by 1985. This was due to the significant and rapid weakening of agriculture in response to a misguided pricing policy, which subsidized urban consumers at the expense of rural farmers and producers of subsistence agriculture. Paradoxically, agriculture was the fundamental basis of the economy from the point of view of export generation, employment and the basis of local industry.[42]

The manufacturing sector, on the other hand, went from representing an average 18 percent of GDP between 1970 and 1975, to 29 percent between 1980 and 1985. This was the result of both protectionist policies and a political alliance especially after 1979 that favored the sector with resources in hopes of earning the confidence of entrepreneurs, thereby bolstering production of urban consumer goods and employment in the cities.

[42] For a detailed analysis of forward and backward linkages of the Nicaraguan economy see Mayorga (1986)

Table 3.1: Productive Sector Structure as Percentage of GDP
(GDP in Millions of Constant 1980 Dollars)

Sectoral Structure	1960	1975	1980	1985	1990	1993	1996
Gross Domestic Product	**1,030**	**2,573**	**1,846**	**1,937**	**1,815**	**1,813**	**2,064**
Agricultural Sector	24	23	25	18	24	24	26
Manufacturing Sector	14	22	29	29	22	22	21
Services and other Non-Tradable urban activities	54	52	52	44	44	52	52
Commerce	21	21	21	19	17	18	18
Construction, Transport And Communication	7	10	9	9	8	8	5
Electricity, gas and water	1	2	2	2	3	3	4
Government	7	5	10	13	13	11	9
Other services	8	7	6	5	5	4	4

Source: Banco Central de Nicaragua

At the same time, the service sector in general weakened. After maintaining a historical share of GDP of around 50 percent services fell to 40 percent by the mid-eighties. This was mainly explained by the fall in the commercial sector as a scarcity of goods began to permeate the economy. Poverty was concentrated in the rural sector, yet these trends were negative for most poor people, and a significant increase in urban poverty also occurred.

At the end of the eighties, and especially with the change of government towards the right in 1990, the country began to move back to a market economy by reestablishing macroeconomic balances, liberalizing and opening the economy, and accelerating the process of privatization of state enterprises. The contraction of public spending, which substantially reduced the fiscal deficit, the stabilization of prices, and the change in relative prices and deregulation began to restore the confidence of the business sector.

Instead of a continued deterioration of economic growth, as had been the case since 1983, the economy first went through a period of stagnant growth from 1990 until 1993 and recovery from 1994 onward (Figure 3.1). This caused another productive realignment, coherent with the new set of relative prices, which again began to reflect the signals of the international economy more directly. The agricultural sector since the last part of the eighties had started recovering as prices were liberalized and its share of GDP increased in the second part of the nineties to 26 percent, somewhat above its historical norm.

At the same time, manufacturing faced greater international competition and in a recessionary context brought about by the fiscal adjustment process that had begun in the last part of the eighties, succumbed to its scant competitiveness. Industry's share of GDP dropped from an average 29 percent between 1975 and 1985 to 21 percent by 1996. The manufacturing sector was clearly the largest looser, if compared with its artificially high share of GDP achieved in the eighties. The commercial sector increased its share relative to its previous historical position, as the availability of foreign exchange, the liberalization policies and opening up of the economy accelerated consumption, especially of imported goods. The public sector also contracted. These productive dislocations had an impact on the poverty levels of the country which was differentiated by sectors.

The Poverty Profile in Nicaragua from 1985 to 1993

Various studies have been conducted on poverty in Nicaragua throughout the eighties and nineties based on different methodologies that do not permit easy comparisons.[43] This dissertation is the first attempt which compares the mid eighties and the early nineties using household income data. Although it provides a reliable description of patterns and trends, the results must be analyzed with caution since the data are not perfectly comparable.

Two particular problems stand out, the extraordinary inflation and market distortions during the eighties and the fact that one survey was a socio-demographic survey where as the other was a expenditure based living standard measurement survey. Both, however, had information on income which allowed for comparisons.

The National Institute of Statistics and Census (INEC) conducted the Nicaraguan Socio-Demographic Survey (ESDENIC 85) and the World Bank technically and financially supported the Living Standard Measurement Survey (LSMS 93). [44] The original ESDENIC 85 data used an effective total of 128,827 individuals distributed in 20,925 households, both indexed to different expansion factors. For purposes of comparison a sub-sample of 61,500 individuals distributed in 10,058 households was used.

[43] See CEPAL (1981), Secretaría de Planificación y Presupuesto (1983), Menjivar and Trejos (1992), Ministerio de Acción Social (1995) and World Bank (1995).

[44] Secretaria de Planificación y Presupuesto (1985) and World Bank (1993)

The measurement method used to determine the poverty line is based on reported income in the past seven days and a number of complementary questions in order to bring the information from a daily to an annual level. The two surveys had national coverage as samples. Special care was taken in processing the information to obtain comparable useful analytical results which could be validated by economic policy analysis. While data limitations are a constant problem in a country like Nicaragua, an effort was made to take as much advantage as possible of existing information.[45]

Measurements of Poverty and Poverty Profiles

In this section a formal description will be provided of the methodology used for the measurement of poverty and the poverty profile. This methodology is based in Kanbur´s (1987a) framework for the calculation of quantitative estimates of the impact of adjustment on poverty using household income and expenditure surveys. Decomposable poverty indices as a way to trace the impact of adjustment on poverty are used based on the poverty indexes developed by Foster, Greer and Thorbecke (1984). These indexes have many of the required properties for decomposition and sensitivity analysis.

The simplest poverty measure is the head count index. This index provides the proportion of individuals with income or consumption (depending on the

[45] The income method commonly requires correction for underreporting. Data limitations and national accounts undervaluation did not help in solving the problem. The emphasis in this analysis, therefore, was in the use of comparable information to obtain structure and trends.

methodology adopted) below a predefined level of poverty. Poverty measurements are most commonly based on income or expenditure. However, the head count index is insensitive to poverty intensity or the depth of poverty, and to poverty differences among the poor. The Foster, Greer and Thorbecke index (FGT) is an extension of the head count index that corrects for these shortcomings of the head count index. The FGT is defined as

$$P_\alpha = \frac{1}{n} \sum_{i=1}^{q} \left(\frac{Z - Y_i}{Z} \right)^\alpha \qquad (1)$$

where

n = number of individuals in the population,

q = number of individuals below the poverty line,

Z = the poverty line,

Y_i = income of individual i, and

α = degree of poverty aversion.

The poverty aversion parameter can assume any non negative value. The higher the value, the more important the weight given to the extremely poor or those farther away from the poverty line.

If $\alpha = 0$ the index becomes the head count ratio

$$P_0 = \frac{q}{n}, \qquad (2)$$

If $\alpha = 1$ the index becomes the poverty gap

$$P_1 = \frac{1}{n} \sum_{i=1}^{q} \left(\frac{Z - Y_i}{Z} \right). \qquad (3)$$

P_1 is the percentage by which the average income of the poor falls short of the poverty line multiplied by the percentage of the population in poverty. This index is the poverty gap and therefore places emphasis on the intensity of poverty. However, the poverty gap index is insensitive to transfers within the poverty population as long as the average income of the poor does not change.

To incorporate a more comprehensive analysis of poverty focusing on the intensity of poverty the FGT index is calculated for different degrees of poverty aversion. A comparison of the FGT indexes for different degrees of poverty aversion exponents equal to 0, 1 and 2- provides an indication of those sectors with high proportions of the very poor.

In this chapter a set of tables will be presented with estimations for P_0 , P_1 and P_2 for the case of Nicaragua for the two years under comparison. Since P_2 (where the degree of poverty aversion is equal to 2) is more sensitive to the situation of the poorest, a comparison with P_1 can show whether the distribution among the poor has deteriorated or improved. In other words, P_2 refers specifically to the extreme poor, whereas P_1 refers to the intensity of poverty or the poverty gap

which is the percentage by which the average income of the poor falls short of the poverty line.

Since the FGT indexes are decomposable by region, economic sector, gender, area of residency or education, etc., the indexes are also a good tool for determining sources of poverty and changes in poverty over time.[46] One can divide the poor into *k* mutually exclusive groups and construct the index for each sub-group. A poverty profile thus is a special case of poverty comparison that shows how poverty varies across sub-groups of society. It can be used to assess how the sector or regional pattern of economic change affects aggregate poverty. For example, the measure at the national level can be expressed as the sum of regional measures weighted by the share of the population of each region:

$$P_\alpha = \sum_{j=1}^{k} m_j P_j^\alpha \qquad (4)$$

where j = 1,...,k regions

m_j = *the share of population of region j.*

This formulation makes it possible to estimate the contributions of each region to national poverty:

$$c_j = \frac{m_j P_j^\alpha}{P^\alpha}. \qquad (5)$$

[46] See Kanbur (1987b) and Ravallion and Huppi (1991) for applications of this technique.

This feature contributes to make poverty analysis relevant to policymaking, by making it possible to relate macroeconomic changes and impacts by region or socioeconomic group which can be another way to organize the analysis.

The incidence of poverty in Nicaragua 1985-1993: In the period 1985-1993 Nicaragua experienced large increases in poverty levels. By applying different poverty decomposition analyses to the national surveys under study, the picture that emerges is consistent with the policy changes, the economic performance and the structural transformations that the economy underwent through that period.

This section analyzes the contribution of different sectors to the level of poverty during the eighties and nineties. The characteristics of poverty in Tables 3.2 through 3.7 are presented by area of residence, geographic location, and productive and employment sectors. Tables showing the results of the complete poverty decomposition analysis, including poverty by education level, size of household, and other characteristics are included in Annexes B.1 through B.3. The poverty decomposition analysis presented here makes it possible to measure the link between poverty and macroeconomic policy and performance. Through this analysis useful policy considerations can be reached about the impact of policies and macroeconomic performance on the poor disaggregated by sectors. While data constraints do not permit separating the impact of adjustment measures isolated from other events which affected the economy during the years analyzed, important conclusions can nevertheless be reached.

According to the analysis of the ESDENIC 85 and LSMS 93 surveys, based on a poverty line of US $60 a month per person and on the income reported by the head of households in each survey, poverty increased significantly between 1985 and 1993. Table 3.2 shows poverty measures by area of residence in 1985 and 1993. The first three columns indicate the incidence (P_0) or head count index, the intensity (P_1) or gap index and the aversion (P_2) to poverty or extreme poverty. The three columns on the right show the decomposition of each index and contain the contribution of each sub-group to poverty.

Poverty affected 42.8 percent (P_0) of the total population in 1985, and increased its incidence to 68.3 percent by 1993. The change in the intensity indicator (P_1) from 16.2 percent to 35.1 percent, and that of aversion to poverty (P_2) from 8.6 percent to 21.9 percent between 1985 and 1993, also indicate that the intensity and breadth of poverty increased by 1993. P_1 means that the average income gap was 35.1 percent in 1993 below the poverty line as compared to an average of 16.2 percent in 1985. Similarly P_2 means that the extreme poor on average were 8.6 percent of the poor in 1985, but 21.9 percent in 1993.

Table 3.2 Poverty Decomposition Analysis of P Poverty by Area of Residence, 1985 – 1993

1985

Area of Residence	P^0	P^1	P^2	Share of Population	Contribution to National Poverty P^0	P^1	P^2
Urban	0.295	0.095	0.047	0.550	0.379	0.321	0.300
Rural	0.594	0.247	0.136	0.450	0.624	0.683	0.705
Total	0.428	0.163	0.087				

1993

Area of Residence	P^0	P^1	P^2	Share of Population	Contribution to National Poverty P^0	P^1	P^2
Urban	0.529	0.219	0.118	0.570	0.441	0.355	0.306
Rural	0.888	0.528	0.355	0.430	0.559	0.646	0.695
Total	0.683	0.352	0.220				

**calculations based on the Nicaraguan Socio-Demographic Survey (ESDENIC, 1985) and the Nicaraguan Living Standards Measurement Survey 1993, World Bank*

Poverty was fundamentally concentrated in the rural sector. It affected 88.8 percent of the rural population in 1993, and comprised 55.9 percent of the groups below the poverty line by area of residence. However, the increase in poverty in the rural sector from a level of 59 percent in 1985 is explained, in addition to the impact from price controls that were imposed in the first half of the eighties and the contraction of the economy, by the political and military conflict experienced in the rural sector throughout the eighties.

Table 3.3 Poverty Decomposition Analysis of P Poverty by Region of Residence, 1985 – 1993

1985

Region of Residence	P^0	P^1	P^2	Share of Population	Contribution to National Poverty P^0	P^1	P^2
Segovias	0.540	0.214	0.115	0.120	0.152	0.158	0.159
West	0.621	0.262	0.148	0.190	0.276	0.307	0.325
Managua	0.302	0.094	0.044	0.320	0.226	0.184	0.163
South	0.508	0.207	0.113	0.170	0.202	0.216	0.222
Central	0.287	0.100	0.052	0.070	0.047	0.043	0.042
North	0.363	0.133	0.068	0.080	0.068	0.065	0.063
Atlántic	0.269	0.088	0.046	0.050	0.032	0.027	0.026
Total	0.428	0.163	0.087				

1993

Region of Residence	P^0	P^1	P^2	Share of Population	Contribution to National Poverty P^0	P^1	P^2
Segovias	0.828	0.500	0.343	0.130	0.158	0.185	0.203
West	0.654	0.313	0.192	0.130	0.124	0.116	0.113
Managua	0.488	0.192	0.099	0.240	0.171	0.132	0.108
South	0.589	0.277	0.161	0.110	0.095	0.087	0.081
Central	0.793	0.437	0.256	0.140	0.163	0.174	0.176
North	0.831	0.482	0.326	0.130	0.158	0.178	0.193
Atlántic	0.753	0.385	0.235	0.120	0.132	0.131	0.128
Total	0.683	0.352	0.220				

***calculations based on the Nicaraguan Socio-Demographic Survey (ESDENIC), 1985 and the Living Standards Measurement Survey 1993, World Bank*

According to the poverty decomposition analysis by region, a close relationship is found between the situation of political instability and war in the eighties and the concentration of poverty by 1993 (Table 3.3). Poverty by regions, in addition to increasing, spread in large numbers to different locations between 1985 and 1993 toward the scenes of war and political instability. Unlike 1985, when the highest levels of poverty were centered in the western region, by 1993 the

highest levels of poverty were centered in the northern zone, Nueva Segovia and the central part of the country.

From a productive point of view, the problem of poverty was more significant in agriculture, affecting 62.6 percent of the population engaged in agricultural activities in 1985, and increasing to 88.3 percent incidence by 1993 (Table 3.4). The sector explained 53 percent of national poverty by 1993. The level of poverty in the industrial sector grew from 33.8 percent in 1985 to 62.1 percent in 1993, explaining however, only 13.6 percent of national poverty, since a smaller part of the population was engaged in manufacturing activities.

Table 3.4 Poverty Decomposition Analysis of P Poverty by Productive Sector of Head of Household, 1985 - 1993

				1985			
					Contribution to National Poverty		
Productive Sector	P^0	P^1	P^2	Share of Population	P^0	P^1	P^2
Agriculture	0.626	0.270	0.150	0.360	0.527	0.599	0.625
Industry	0.339	0.104	0.049	0.210	0.166	0.134	0.119
Services	0.311	0.104	0.053	0.430	0.313	0.275	0.264
Total	0.428	0.163	0.087				
				1993			
					Contribution to National Poverty		
Productive Sector	P^0	P^1	P^2	Share of Population	P^0	P^1	P^2
Agriculture	0.884	0.533	0.360	0.410	0.530	0.610	0.672
Industry	0.621	0.272	0.151	0.150	0.136	0.116	0.103
Services	0.519	0.216	0.117	0.440	0.334	0.270	0.234
Total	0.683	0.352	0.220				

***calculations based on the Nicaraguan Socio-Demographic Survey (ESDENIC), 1985 and the Living Standards Measurement Survey 1993, World Bank*

The more rapid increase in poverty in the industrial sector, however, mainly an urban activity, is consistent with the opening and liberalization of the economy that began in the late eighties, deepened in the nineties, and which brought the collapse of many urban industries, especially in the capital and the western region of the country.

Poverty decomposed by labor participation characteristics, affected more significantly those employed in subsistence agricultural activities with an incidence of 87.7 percent of the total population engaged in this type of job by 1993 (Table 3.5). Also, workers in the modern agricultural sector fare the worst after subsistence agriculture, as 81.2 percent of those engaged in the modern agricultural sector were poor. Agricultural workers, in addition to typically depending on seasonal employment, generally received much lower wages than the workers of other sectors. At the same time, poverty affected 52.5 percent of those who worked in the urban informal sector.

Subsistence agriculture and urban informal workers were the largest contributors to total poverty by the classification of sector employment contributing 52.6 and 22.3 percent of the total of national poverty respectively in this category. This is an indication that the agrarian reform process did not have an impact on solving poverty for rural subsistence farmers. The increase in poverty in the urban informal sector at the same time was the result of rural to urban migration, caused by the war, and by the contraction of the manufacturing and public sectors.

Table 3.5 Poverty Decomposition Analysis of P Poverty by Employment Sector of Head of Household, 1985 – 1993

1985

Employment Sector	P^0	P^1	P^2	Share of Population	Contribution to National Poverty P^0	P^1	P^2
Modern Agriculture	0.698	0.307	0.165	0.050	0.082	0.094	0.095
Subsistence	0.596	0.260	0.149	0.250	0.348	0.399	0.429
Formal	0.303	0.083	0.036	0.080	0.057	0.041	0.033
Urban Informal	0.330	0.124	0.068	0.330	0.254	0.251	0.261
Public Sector	0.382	0.120	0.054	0.290	0.259	0.213	0.182
Total	0.428	0.163	0.087				

1993

Employment Sector	P^0	P^1	P^2	Share of Population	Contribution to National Poverty P^0	P^1	P^2
Modern Agriculture	0.812	0.460	0.306	0.070	0.083	0.092	0.097
Subsistence	0.878	0.523	0.351	0.410	0.527	0.610	0.656
Formal	0.495	0.188	0.098	0.110	0.080	0.059	0.049
Urban Informal	0.526	0.214	0.112	0.290	0.223	0.177	0.148
Public Sector	0.474	0.187	0.098	0.120	0.083	0.064	0.054
Total	0.683	0.352	0.220				

***calculations based on the Nicaraguan Socio-Demographic Survey (ESDENIC), 1985 and the Living Standards Measurement Survey 1993, World Bank*

Comparing the levels of poverty of the formal and informal sectors of the economy, 72.9 percent of people in the informal sector were poor (Table 3.6). The contribution of the informal sector to national poverty was 83.2 percent of the total in 1993. The informal sector contribution to the increases in poverty became more important in the second half of the eighties, as it served as an alternative to low paying jobs in the formal sector. To the extent that a large black market for consumer goods and foreign exchange developed, these activities in the informal sector became better income alternatives than formal paying jobs, but were

insufficient to overcome poverty. In the nineties, the increased informality of the labor force was largely explained by the contraction of the manufacturing and public sector, which in turn, increased underemployment considerably at the time.

Table 3.6 Poverty Decomposition Analysis of P Poverty by Formal / Informal Sector of Head of Household, 1985 – 1993

	1985						
					Contribution to National Poverty		
Formal / Informal Sector	P^0	P^1	P^2	Share of Population	P^0	P^1	P^2
Formal Sector	0.423	0.146	0.070	0.460	0.455	0.412	0.374
Informal Sector	0.432	0.177	0.100	0.540	0.545	0.588	0.627
Total	0.428	0.163	0.087				

	1993						
					Contribution to National Poverty		
Formal / Informal Sector	P^0	P^1	P^2	Share of Population	P^0	P^1	P^2
Formal Sector	0.525	0.226	0.127	0.220	0.169	0.141	0.127
Informal Sector	0.730	0.391	0.249	0.780	0.833	0.867	0.884
Total	0.683	0.352	0.220				

***Calculations based on the Nicaraguan Socio-Demographic Survey (ESDENIC), 1985 and the Nicaraguan Living Standards Measurement Survey 1993, World Bank*

At the sector level, there were large and differentiated increases in poverty between 1985 and 1993 as shown in this section. While the poor were concentrated in the rural sector, urban poverty increased rapidly. Subsistence agriculture, modern agricultural and urban informal workers suffered the most important impacts and explained the large part of total poverty by employment category. This information separated by region, productive sectors or by employment category in particular can

be useful to design alternative adjustment packages that explicitly address poverty concerns.

Decomposition of the Changes in Poverty between 1985 and 1993: In the previous section, the FGT poverty indexes were decomposed to show sector contributions to poverty. In this section, the FGT indexes are decomposed to show the source of changes in the overall poverty index over time. This analysis is shown in Table 3.7 and compares the situation in Nicaragua between 1985 and 1993. These two types of decompositions are additional useful tools to understand the nature of poverty and the impact of policies and changes that originate in the macroeconomy and the performance of the different productive sectors over time.

For an index P, changes between two points in time can be decomposed as follows:

$$P_t - P_0 = \sum_{j=1}^{k} \underbrace{\left[m_{j0}\left(P_{jt} - P_{j0}\right)\right]}_{\text{within groups}} + \underbrace{P_{j0}\left(m_{jt} - m_{j0}\right)}_{\text{between groups}} + \underbrace{\left(P_{jt} - P_{j0}\right)\left(m_{jt} - m_{j0}\right)}_{\text{cross product}}. \qquad (6)$$

The first term on the right hand side of the equation represents the contribution of changes in the poverty indexes within each group j. The second refers to changes due to movements of the population between groups. The third term, or the cross-product, tells whether the groups have expanding or falling poverty indexes. If it is positive, the expanding sectors have rising poverty. If the cross-product is negative, it means that the contracting sectors have falling

poverty.[47] The incidence (P_0), the intensity (P_1) and the aversion or extreme poverty (P_2) are decomposed in three types of changes that originate from "within groups", "between groups" and a "cross product" to provide a more dynamic view of the inner workings of the changes on poverty indexes across specific sectors. This is not a causality analysis, but still provides information about the dynamics of poverty changes. For convenience in the formula the poverty aversion superscripts are not shown.

The increase in poverty between 1985 and 1993 came almost equally from the increase in both urban and rural poverty as shown in Table 3.7. This table shows changes in the level of poverty by characteristics of the heads of households. Of the 25.4 percentage point increase in poverty during the period, 52.1 percent (.1324/.254) is explained by an increase in rural poverty, however, as the cross product signs indicate by 1993, urban poverty had an increasing tendency, while rural poverty was declining. This in part is explained by the dynamics of the real sector of the economy and rural to urban migration.

These results and trends, along with other time series data on labor and economic growth by sector, however, seem to indicate that in the eighties the rural sector was most affected by the growth of poverty relative to other sectors. In the nineties, the urban sector bears the burden of the largest increase in poverty levels.

[47] For applications to Latin American countries of these techniques see Morley (1995) and Ganuza, et al (1998).

Considering the formal and informal sectors, 65.2 percent (.1670/.2565) of the increase in poverty during the period is explained by the increase in poverty in the informal sector. At the same time, while poverty was decreasing in the formal sector, it was because it was increasing in the informal sector as the latter was serving as an escape valve.

Estimates by the Nicaraguan Institute of Statistics and Census (INEC) show that the informal sector employment level increased from 43.6 percent to 47.6 percent between 1970 and 1989. This tendency became more pronounced in the nineties. By 1991, the employment level in the informal sector had jumped to 52.1 percent and by 1992 to 64.5 percent, consistent with the country's environment of crisis and of economic contraction of a number of sectors, especially the public sector and manufacturing. According to the LSMS 93, 70 percent of employment was in the informal sector by 1993.

Considering the labor sector in more detail by characteristic of employment, most of the increase in poverty came from those engaged in subsistence agriculture and urban informal employment in about equal proportions, which together explained about 72 percent of the increase in poverty when considering the change by type of jobs.

Table 3.7 Changes in the Level of Poverty by Characteristic of Head of Household, 1985 - 1993

	P^0			P^1			P^2		
	Within Groups	Between Groups	Cross Products	Within Groups	Between Groups	Cross Products	Within Groups	Between Groups	Cross Products
Area of Residence									
Urban	0.129	0.006	0.005	0.068	0.002	0.003	0.039	0.001	0.001
Rural	0.132	-0.012	-0.006	0.127	-0.005	-0.006	0.099	-0.003	-0.004
Total	0.261	-0.006	-0.001	0.195	-0.003	-0.003	0.138	-0.002	-0.003
			0.254			0.190			0.133
Formal/Informal Sectors									
Formal	0.047	-0.102	-0.024	0.037	-0.035	-0.019	0.026	-0.017	-0.014
Informal	0.161	0.104	0.071	0.116	0.043	0.051	0.080	0.024	0.036
Total	0.207	0.002	0.047	0.153	0.008	0.032	0.106	0.007	0.022
			0.257			0.192			0.136
Productive Sector									
Agriculture	0.093	0.031	0.013	0.095	0.014	0.013	0.076	0.008	0.011
Industry	0.059	-0.020	-0.017	0.035	-0.006	-0.010	0.021	-0.003	-0.006
Services	0.089	0.003	0.002	0.048	0.001	0.001	0.027	0.001	0.001
Total	0.242	0.014	0.000	0.178	0.008	0.008	0.124	0.005	0.005
			0.254			0.191			0.135
Employment Sector									
Modern Agriculture	0.006	0.014	0.002	0.008	0.006	0.003	0.007	0.003	0.003
Subsistence	0.070	0.095	0.045	0.066	0.042	0.042	0.051	0.024	0.033
Formal	0.015	0.009	0.006	0.008	0.003	0.003	0.005	0.001	0.002
Urban Informal	0.065	-0.013	-0.008	0.030	-0.005	-0.004	0.015	-0.003	-0.002
Public Sector	0.027	-0.065	-0.016	0.020	-0.023	-0.012	0.013	-0.009	-0.008
Total	0.183	0.040	0.030	0.131	0.025	0.033	0.090	0.016	0.028
			0.253			0.190			0.134

***calculations based on the Nicaraguan Socio-Demographic Survey (ESDENIC), 1985 and the Living Standards Measurement Survey 1993, World Bank*

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			0.253			0.190			0.134

***calculations based on the Nicaraguan Socio-Demographic Survey (ESDENIC), 1985 and the Living Standards Measurement Survey 1993, World Bank*

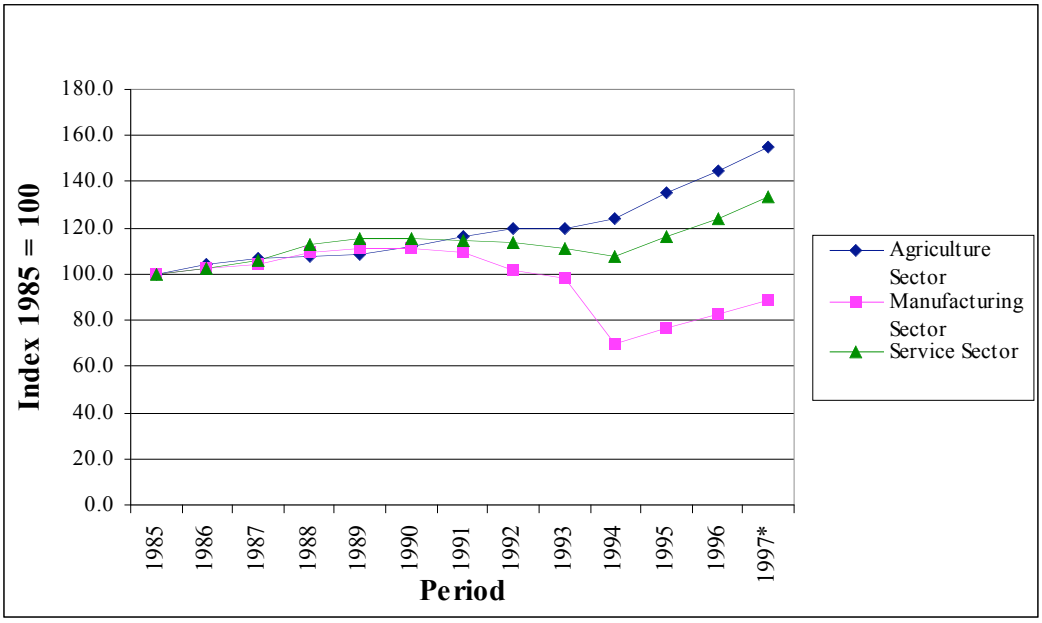
This is a reflection of two different dynamics in the rural and urban sectors. All productive sectors suffered increases in poverty. Yet of the total increase in poverty, the largest increases came from agriculture, which represented 36.5 percent (.0928/.2536) of the change in poverty. The service sector explained 35.2 percent and industry 23.4 percent of the increase in poverty during the period. The contraction of commercial activities in the service sector expelled people out of jobs, which ended unemployed or underemployed in the cities and increasing urban informal poverty levels.

These patterns of change are reflected in the employment sector categories, where subsistence agriculture accounts for 37.3 percent of the increase in poverty and where urban informal employment explains 25.6 percent. While the cross product indicates that urban informal and public sector employment poverty levels were decreasing, for modern agriculture, subsistence and formal urban employment poverty was increasing by 1993.

Those that were engaged in urban informal employment came from recessionary productive sectors such as manufacturing, government and services. These were sectors of the economy where the impact in terms of poverty indicators were important, given the changes in policies and the performance of the economy in the urban sector. This can be noted considering the evolution of the absorption of the labor force in which growing open unemployment seems to have affected the urban sector in a special way.

According to Figure 3.3 on labor force growth, the manufacturing sector, ended up with a much smaller labor force throughout the nineties than it had in 1985. Taking the level of employment in 1985 as a base and developing an index for comparison purposes, the index shows a drop of over 30 points in the early nineties compared with the labor force which was employed in the manufacturing sector in the mid eighties. This trend was more moderate in the other sectors which experienced a point of inflection in 1994 growing in numbers at a faster pace compared to the employment level in 1985.

Figure 3.3: Evolution of Labor Force Growth by Sector



Source: Ministerio del Trabajo

The indicators of Tables 3.2, 3.3 and 3.4 at the same time show that even though the share of poverty is greater in the rural sector, the rate of growth of

poverty in the period being analyzed was greater in the urban informal sector. The city of Managua, the country's capital accounted for 23.8 percent of the increase, and experienced the fastest increase in poverty, more so than in any other region. However, subsistence agriculture closely follows the same pattern as the urban informal sector, and by region, those affected by the war, the north, central and the Segovia regions, are the ones that bear the largest burden of the origin of poverty.

Income distribution: Income distribution deteriorated between 1985 and 1993 as well, which was the opposite of what was desired by government policy. In 1985 the economy was still at a high point in terms of the recovery that took place after the change of government and political regime in 1979. In 1993, the economy was as its lowest point after the prolonged economic crisis that developed afterwards.

The bottom thirty percent of the population by 1985 had about 10 percent of total income**,** while the highest tenth had 27.1 percent. By 1993, however, the first two tenths did not reach 1 percent of total income, while the top tenth had concentrated 51.5 percent of total income. The difference in the magnitudes between the two periods, however, calls for caution, particularly considering the distortions of the economy in the eighties. Hence, it would be prudent to give greater weight to the trend that these figures reveal than to the magnitudes themselves.

Table 3.8: Comparative Income Distribution by Decile 1985-1993

Tenths	ESDENIC 85 Income Distribution	LSMS 93 Income Distribution
First Decile	2.38%	0.24%
Second Decile	3.58%	0.73%
Third Decile	4.47%	1.35%
Fourth Decile	5.96%	2.42%
Fifth Decile	7.15%	3.63%
Sixth Decile	8.35%	5.08%
Seventh Decile	10.43%	7.26%
Eighth Decile	12.67%	9.67%
Ninth Decile	17.89%	18.14%
Tenths Decile	27.11%	51.49%

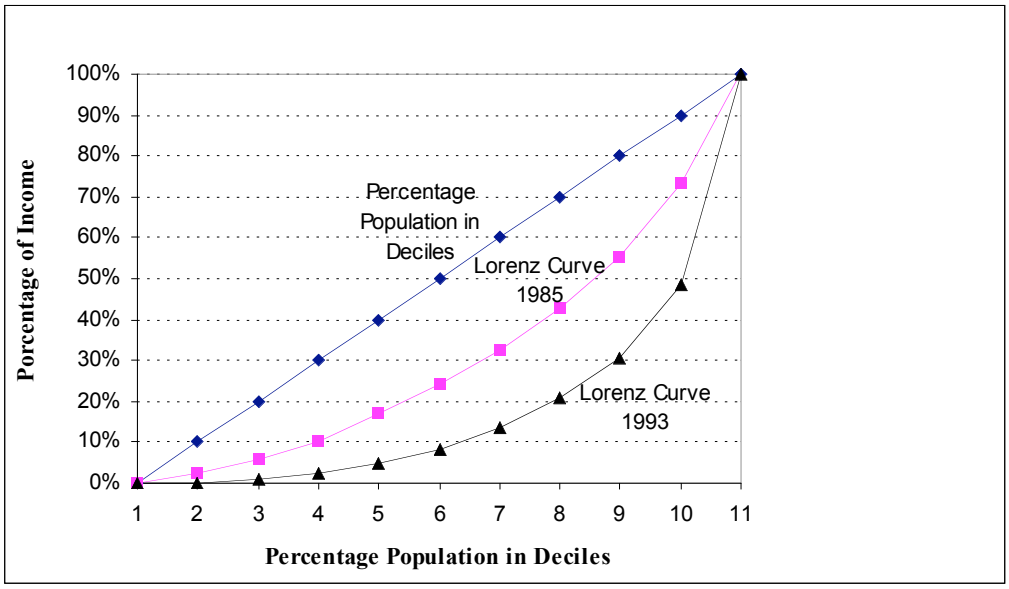
Source: Calculations based on the Nicaraguan Socio-demographic Survey (ESDENIC) 1985, and the Living Standard Measurement Survey (LSMS) 1993.

Surveys of producers conducted by the Ministry of Agriculture and Livestock for 1997, however, gathered results in the rural sector that are similar to the distribution found by the 1993 study, with the top 10 percent of the population accounting for around 50 percent of total income (Table 3.8).

The Lorenz curves in the Figure 3.4 show how the 1993 relationship between the population percentiles and corresponding income percentage for each percentile move away from the diagonal. This illustrates the greater income concentration or greater inequality produced in this period in relation to 1985.[48]

[48] The diagonal reflects a correspondence in which the percentage of income received in each point along it is exactly equal to the percentage of income recipients, which makes these the points of perfect equality. The further from the diagonal, the greater is the income inequality.

Figure 3.4: Nicaragua: Lorenz Curve 1985 and 1993



Source: Calculations based in ESDENIC 1985 and LSMS 1993

The income distribution model in the Nicaraguan case reflects the characteristics of a dual economy in which the modern sector enriches itself, affecting a limited number of people in the modern sector, while workers and their income levels in the traditional sector either remain constant or deteriorate.[49] This unequal distribution limits the impact of economic growth on poverty.[50]

Conclusion

The abrupt changes in economic regimes in Nicaragua in 1979 and 1990 and as the economy contracted brought significant increases in poverty. The

[49] For a discussion of this typology, please see Fields (1980), pp. 46-52.

[50] See Morley (1995)

restructuring of economic activities displaced large segments of the labor force. Studies show that poverty tends to increase when there is a contraction in growth and to decrease when growth resumes. However, it is easier to increase poverty than to reduce it, once growth recovers.[51]

The literature on macroeconomics and poverty, argues that macroeconomic shocks are the single most important cause of rapid increases in poverty.[52] Nonetheless, the impact on poverty is differentiated depending on initial conditions, the nature of the shock and of the adjustment program applied. These elements are present in the Nicaraguan case where all sectors suffered deterioration, urban and rural, agricultural and industrial activities, and the service sector although with important differentiations. Thus, the contraction of the manufacturing, public and service sectors, all essentially urban activities, suffered a faster deterioration thereby impacting more heavily the urban sector, relative to the deterioration that took place in the countryside. However, the share of poverty in the rural sector continued to be more important in terms of total poverty levels in Nicaragua.

The decomposition analysis provides empirical evidence of the major changes in the productive and labor sectors underlining the evolution of poverty. These changes in the case of Nicaragua resulted from macroeconomic shocks as well as adjustment policies. Adjustment policies therefore, if they are poverty

[51] See Morley (1995) and Ganuza et.al. (1999)

[52] See Lustig (2000)

sensitive, have to take into account these potential impacts as macroeconomic imbalances are corrected.

In terms of adjustment policies, from 1985 onward, inconsistent attempts to control the fiscal deficit reduced transfers to the poor, especially food and basic goods subsidies. Public employment was reduced, and prices for staples in the second half of the eighties were liberalized particularly affecting urban consumers. The opening of the economy on the other hand, affected manufacturing jobs and increased urban losses of income and employment. The unfavorable terms of trade against the rural sector and the war, in the second half of the eighties specially, similarly deteriorated conditions in the countryside. The service sector, commerce in particular, contracted as rationing and scarcity became widespread, leading to the development of a black market for consumer goods and foreign exchange.

The next chapter will look in more detail at the specific economic policies that lead to these different sectoral impacts. It will discuss the relationship between the evolution of poverty and the changes in macroeconomic policies and performance, to conclude with poverty and economic growth alternatives and prospects. This last point is based on the characteristics of the poverty profile of the country and previous macroeconomic developments. At the same time, the concluding comments are relevant to the simulations of Chapter 5, which has projections of alternative policy options for the next seven years with 1994 as the baseline.

Chapter 4: Poverty, Economic Crisis and Macroeconomic Adjustment Programs 1985-1993

This chapter will analyze in detail the relationship between economic crises, macroeconomic adjustment policies and poverty for the case of Nicaragua during the eighties and nineties. Macroeconomic policies and indicators will be presented and the impact of these policies will be related to the findings from the previous chapter in terms of their effect on poverty.

The literature on the analysis of adjustment, economic crisis and poverty during the nineties is not extensive. However, the work of Grootaert (1996) for Cote d'Ivoire, and Lustig (1995), Barry (1998) and Ganuza et.al., (1999) for Latin American countries are used as basic references for this analysis of the Nicaraguan case. These four studies combine sequential economic policy descriptions with macroeconomic indicators in the context of the poverty profiles and employ decomposition analysis.

Methodologically, this analysis is also framed in terms of transmission mechanisms as discussed by Ferreira et al., (1999) and Lustig and Walton (1999). This approach departs from the notion that the channels through which households feel the impact of macroeconomic crises can be traced to the different sources of household income, and to the prices household faces when purchasing goods and

services. The sources of household income are wages, salaries, self-employment incomes, returns on physical assets and the receipt of public transfers[53].

The literature on transmission mechanisms from the macroeconomy to poverty distinguishes five main types of transmission mechanisms:

- Changes in relative prices, which change relative wages, employment patterns, and consumption baskets.
- Changes in aggregate labor demand, which can reduce employment levels and/or wage rates.
- Changes in the rate of returns on assets, which includes the regressivity of the inflation tax.
- Changes in the level of public transfers, either in cash or in kind; and changes in the community environment in terms of public health or public safety.

These changes will be discussed in the context of describing macroeconomic policies and their impact in economic indicators. The chapter is organized as follows. In the first sections the economic policies of the Sandinista administration of the eighties will be discussed. The economic and income distribution growth model of the regime and its implications on poverty in the country will be addressed as structural and initial conditions are laid out. The policy discussion will be divided between structural aspects and monetary and financial issues. The second part will address the macroeconomic policies during the nineties under the Chamorro regime. A third section looks into perspectives for future growth and poverty reduction.

[53] For a discussion of transmission mechanisms see Ferreira et al., (1999), and Lustig and Walton .

Macroeconomic Policy in the Eighties under the Sandinista Regime

Nicaragua underwent two abrupt changes in its political system first in 1979 and then again in 1990. Each of these changes fundamentally disturbed the country's economic and social development model. In 1979 a leftist government took power through an armed uprising and in 1990 a democratic center right government won multi-party elections. With the establishment of the Sandinista regime in 1979, the country went from a market economy to an economy that aimed at having some degree of centralized planning. The attempts at centralized planning were based on the nationalization of natural resources, the banking system, foreign trade and existing agro-export businesses confiscated from supporters of the previous regime. Starting in 1985, however, market mechanisms began to be reintroduced, given the difficulties and distortions faced by government policies while trying to provide an alternative to market forces.

For a prolonged period of time however, the country was neither a planned economy nor a market economy.[54] Some analysts tried to characterize this in the first half of the eighties as a period in which the country's economy was undergoing a transition that had its own set of specific features (Coraggio, 1985).[55] In this context, several critical elements emerged that conditioned the evolution of the economic and social policies for the period of the eighties and the nineties.

[54] For a more detailed analysis of this contrasting logic see Arana (1988) in CIERA.

[55] The literature that had this perspective was in large part trying to justify the many limitations that the country's economic performance had. Many of these analysts were sympathetic to the revolution.

The Sandinista government's model of growth, poverty and income distribution: The Sandinista revolution sought to modify income distribution in Nicaragua through a redistribution of assets. This was particularly pronounced in the Agrarian Reform process. In addition, the government tried to implement a progressive system of taxes on income and on wealth to pay for direct transfers to low income sectors. And, finally, an effort was made to alter the distribution of income through policies designed to change the relative prices of factors of production, particularly the relationship between labor and capital.

The source of growth in the plans of the Sandinista administration was to come primarily from public investments especially in the following three areas: agro-industrial projects geared toward exports; import substitution projects, especially food and energy production; and the production of basic grains using irrigation.

However, even though the social base of the Sandinista Revolution was presumably made up of workers and peasants, many of the policies turned out to be if not by design, by default, contrary to the interests of the sectors that were supposed to be their direct beneficiaries. In most instances shortcomings in the policy design, and due to internal and external shocks, in the end, there was little to show in terms of poverty reduction, income distribution and growth through the eighties. Subsistence agricultural workers and the self-employed from the growing urban informal sector were the hardest hit by the economic policies and economic

performance of the eighties as production contracted.

Given the weight of rural poverty in the first place, it is particularly important to analyze the significant transformations that have taken place in land ownership in Nicaragua, in order to evaluate the outcome of the strategy of the Sandinista Administration. The land of large private owners was redistributed to cooperatives and new small individual beneficiaries which made up the so called reformed sector. Large private owners went from having 50 percent of the area in farms to having 20 percent by 1991 while the reformed sector increased its ownership to 36 percent of the land in farms (Table 4.1).

It is important to recognize significant weaknesses in this process, however. On the one hand, by not accompanying the agrarian reform with other supports to production such as credit, technical assistance, adequate infrastructure and appropriate commercialization policies, its impact tended to be limited to the livelihood of small agricultural producers and workers.

Table 4.1 Nicaragua Land Tenure Evolution (000s): 1978, 1984, 1988, 1991

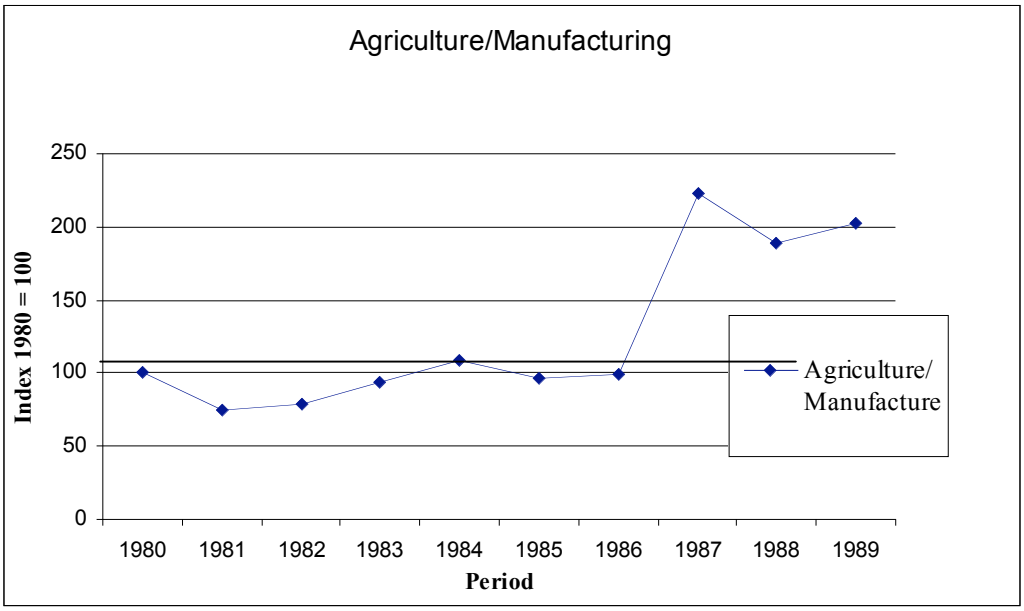
	1978		1984		1988		1991	
Sector	**Area**	**%**	**Area**	**%**	**Area**	**%**	**Area**	**%**
Large Private Owners	4,231	**52.0**	1,992	**24.8**	1,653	**20.5**	1,653	**20.5**
Over 500 Mzs.*	2,920	**36.2**	1,003	**12.4**	604	**7.5**	604	**7.5**
200 to 500 Mzs	1,311	**16.2**	988	**12.4**	1,048	**13**	1,048	**13**
Small and Medium Owners	3,842	**47.6**	3,078	**38.1**	3,639	**45**	3,519	**43.5**
50 to 200 Mzs.	2,431	**30.1**	2,391	**29.6**	2,296	**28.4**	2,175	**26.9**
10 to 50 Mzs	1,241	**15.4**	560	**6.9**	1,555	**14.3**	1,155	**14.3**
Less than 10 Mzs	170	**2.1%**	127	**1.6**	189	**2.3**	188	**2.3**
Reformed Sector	0	**0.0**	3,002	**36.2**	2,780	**34.4**	2,901	**35.9**
Individual Beneficiaries	0	**0.0**	54	**0.7**	210	**2.6**	949	**11.8**
Cooperatives	0	**0.0**	1,430	**17.7**	1,622	**20.1**	1,722	**21.3**
Credit and Service Cooperatives	0	**0.0**	804	**10**	917	**11.4**	969	
Production Cooperatives	0	**0.0**	626	**7.8**	705	**8.7**	753	
Agrarian Reform Enterprises		**0.0**	1,517	**18.8**	948	**11.7**	229	**2.8**
Total	8,073	**100.0**	8.073	**100**	8,073	**100%**	8,073	**100**

Source: Estudio Estratégico de la Reforma Agraria. Instituto Nicaragüense de Reforma Agraria (INRA)

* 1 Ha = .7 Manzana

On the other hand, the main problem in the eighties was the unfavorable relationship in prices from the city to the countryside, a factor which was particularly important in the first five years of the Sandinista regime. An analysis of the relative price relationship between agriculture and manufacturing for the period 1980-1985 confirms how the exchange relations deteriorated around 30 percentage points against the agricultural sector. A recovery of agricultural prices took place in the mid eighties once prices were liberalized in the second half of the eighties. However, the war in the countryside against the leftist regime by forces opposed to the Sandinista revolution undermined the benefits of price liberalization in the rural sector.

Figure 4.1: Terms of Trade



Source: Calculations based on Secretaría de Planificación y Presupuesto (SPP)

There was, therefore, an intrinsic contradiction between wanting to improve the peasantry's living standards and controlling prices and the commercialization of peasant products in order to keep food cheap for the city in the first part of the eighties. All of this acted against the ultimate objectives of an agrarian reform and in turn explained in large part the increase in poverty that took place in the rural sector during this period.

The combination of price liberalization and the war in the second half of the eighties caused food prices to skyrocket and the terms of trade to dramatically improve in favor of the countryside (Figure 4.1), but at the same time, land under cultivation was drastically reduced. Therefore, the urban sectors suffered a deterioration of real wages while reduced production in the agricultural sector

also increased poverty in the rural sector. The overall wage rate was 29.1 percent in 1989 of the level it had been in 1980 (Table 4.2).

The Sandinista government policy of direct transfers to the lowest income groups also proved to be unsustainable. This was because it was not backed by the necessary production level, public income, or the availability of external resources. Furthermore, military expenditures became an important priority. The average fiscal deficit was 19.1 percent from 1980-1988, reaching a peak deficit of 27.6 percent of Gross Domestic Product in 1988 (Table 4.3). In addition, a progressive tax system was never consolidated due to the difficulties of implementation typical for all developing economies.

Finally, the relationship of factor prices was always poorly understood in Nicaragua during the eighties, especially in terms of poverty concerns. In the technocratic development orientation that prevailed at the time, especially with respect to agrarian policy, it was inadvertently decided, in the name of productivity and modernization, to emphasize the use of cheap capital inputs at the expense of the intensive use of labor, even though the latter was a truly abundant resource in the country. This skewed investment, particularly public investment, toward very costly projects that depended on foreign resources while underemployment grew and reached 39.4 percent of the labor force in 1989 (Table 4.2).

Monetary-Financial Aspects: In financial terms, the eighties were characterized by a deepening of both domestic and, in turn, external economic

imbalances. This caused a contraction in investment levels and economic growth which thereby increased poverty levels.[56] An expansive fiscal and monetary policy between 1979 and 1981 was sustained by an abundant flow of foreign resources. The significant expansion of domestic credit and the growth of public spending had important effects on the demand side and led to positive results in the growth of Gross Domestic Product (GDP), even if below expectations. After falling around 26.5 percent during the upheaval of 1979, the economy grew at an average rate of 4.9 percent between 1980 and 1981 (Table 4.2).

The first attempt in the eighties to adjust the economy occurred in 1982 in response to the negative performance of the export sector, increased foreign debt payments and the reduction of external financing in a context of increased domestic political polarization. As a result of the adjustment process economic growth was below one percent in 1982 but exports also contracted 20 percent with respect to the previous year. By then the exchange rate had lost more than 30 percentage points with respect to 1980 primarily as a result of fixing the exchange rate for exports and domestic inflationary pressures.

[56] For an analytical framework applied to Nicaragua and the transmission of internal imbalances to the external sector in the context of an open economy see N. Ramirez (1989).

Table 4.2 Macroeconomic Indicators 1980-1989

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Population (000)	2,741	2,823	2,907	2,994	3,084	3,176	3,271	3,368	3,469	3,573
GDP Million US$	2,080	2,390	2,418	2,561	2,583	2,465	2,369	2,415	2,199	2,268
Real GDP Million US$	2,080	2,191	2,174	2,274	2,238	2,147	2,125	2,146	1,847	1,816
GDP US$/Per Capita (1980)	759	776	748	759	726	676	669	645	548	523
Real GDP Growth (%)	4.5	5.4	0.8	4.6	-1.6	-4.1	-1	0.7	-12.4	1.7
Rate of Inflation										
Annual Average (%)	35.3	23.9	24.8	31.1	35.5	219.5	681.6	911.9	14,293	4,770
Annual Accumulated (%)	24.9	23.2	22.2	32.9	50.2	334.3	747.5	1,347	33,603	1,689
Underemployment (%)	18.3	16	19.9	18.9	20.6	23.1	25.7	28.9	33.5	39.4
Wage Index 1980 = 100	100	101.2	97.9	96	93.8	83.8	84.9	61.9	42.3	28.1
Real Exchange Rate 1980 = 100	100	88.2	72.2	56.6	43.5	42.1	17.2	3	20.3	40.3
Trade Balance	-442	-490	-367	-355	-413	-587	-513	-552	-578	-299
Exports	445	509	408	452	413	305	248	273	230	318
Imports	887	999	776	807	826	892	761	825	807	618
Current Account Balance (***)	-430	-591	-492	-507	-597	-587	-593	-666	-634	-370
External Debt	1,851	2,537	3,033	3,990	4,850	5,622	6,951	8,521	9,200	10,485
External Debt Service	136	192	203	154	158	142	110	119	107	66
Debt Renegotiated	566	395	189	641	351	377	359	54	473	56
Accumulated Arrears	296	203	345	370	644	959	1,629	2,337	2,556	2,960
Int'l Reserves Mill. US$										

Sources: Banco Central de Nicaragua, Instituto Nacional de Estadísticas y Censos, Ministerio de Finanzas, Ministerio de Economía y Desarrollo and Ministerio de Cooperación Externa

From 1983 to 1984 macroeconomic deficits and distortions in the economy increased. The fiscal deficit grew from an average 10.6 percent between 1980 and 1982 to an average of 27 percent between 1983 and 1984 (Table 4.3). Important public agro-industrial and energy capital intensive investment projects were initiated which later proved to be ineffective and highly inefficient.[57] The investment level averaged around 22 percent of GDP from 1980 to 1987 and for the most part it was public investment.

[57] For a detailed study of investment please see Arguello, et al., (1988)

Table 4.3 Macroeconomic Relationships in Percentages 1980-1990

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Exports/GDP	24.2	26.4	24.5	25.1	20.2	8.6	15.4	15.2	17.2	23.1	27.4
Imports/GDP	43.3	39.2	28.8	32.2	32.2	33.8	29.2	30.5	41.5	32.6	31.1
External Debt/Exports.	415.7	498.2	742.5	882.9	1,174	1,844	2,805	3,123	4,009	3,293	3,241
External Debt/GDP	89	106.2	125.4	155.8	187.8	228.1	293.4	352.8	418.3	462.2	456.2
Arrears/Exports	66.5	39.8	84.5	82	155.9	314.6	657.3	856.6	1,112	929.8	1,220
Arrears/GDP	14.2	8.5	14.3	14.5	24.9	38.9	68.8	96.7	116.2	130.5	171.7
Investment/GDP	16.8	24.4	20.2	21	21.6	22.3	22.3	22.1	17.8	15.4	13.5
Fiscal Deficit/GDP	8.4	9.9	13.5	29.7	24.5	23.3	17.6	16.6	27.6	2.6	15
Fiscal Revenues/GDP	22.2	24.3	25.8	31.2	35.2	32.3	32.4	27.7	20.3	24.1	17.7
Fiscal Expenditures/GDP	30.6	34.3	39.3	60.9	59.8	55.6	50	44.3	45.9	30.7	38
Money Suply/GDP	33.4	36.2	37.6	50.2	64.1	61.6	55.4	59.7	60.9	24.7	6.1
M1	21.3	23.2	24.4	34.7	46.4	50.6	47.3	56.2	57.7	21	4.8
M2	9.4	9.2	10.9	16.6	25.3	24.9	23	27.2	21.9	9.1	3
M3	12.1	13	13.1	15.6	17.7	11	8	3.6	3.1	3.7	1.3

Sources: Banco Central de Nicaragua, Instituto Nacional de Estadísticas y Censos, Ministerio de Finanzas, Ministerio de Economía y Desarrollo and Ministerio de Cooperación Externa

This period also coincided with an important gap in terms of foreign resources. As spending increased across the board, including larger amounts of subsidies and defense spending, the government had to rely on domestic money emissions that eventually triggered an uncontainable inflationary process. The annual average inflation rate of the first half of the eighties dramatically increased from 30.1 percent to 14.2 thousand percent in 1988 when it reached its peak (Table 4.2). The regressivity of the inflationary tax especially affected the poor.

In this context, the real exchange rate deteriorated over 40 percentage points by 1983 from its 1980 level (Table 4.2). Nicaragua's exports, which had reached a peak of US$650 million in 1978, fell to an average US$435 million during 1980-84 and would later fall even further to US$282 million during 1985-87. This

strong fall of exports in turn translated into a growing foreign debt and service arrears. The debt climbed from US$1.3 billion in 1979 to US$9.2 billion in 1988.[58]

In response to these dramatic macroeconomic fluctuations, a new adjustment program was undertaken in February of 1985. New policy measures were introduced that were designed to reduce the deficit through a hiring freeze in government and a spending freeze in health, education and housing as well as an elimination of a large part of the subsidies on basic goods, reduction of subsidies on public goods, and re-prioritized investment spending. Per-capita social spending fell 30 percent from 1985 to 1987 (Table 4.4).

Credit availability also contracted while taxes rose and wage increases were decreed to compensate for the elimination of subsidies. At the same time, the exchange rate subsidy was partially abandoned; the official exchange rate went from 10 to 28 córdobas to a dollar. A strengthening of market mechanisms also took place, with the aim of maintaining a more dynamic and closer relationship between the evolution of the economy, macroeconomic policy and the internal price system.[59]

[58] For a more detailed analysis of this period please see Arana et al., (1987).

[59] For a detailed analysis of the shift of economic policy please see Pizarro (1987).

Table 4.4 Nicaragua: Social Spending 1981 – 1995

	1981	1983	1985	1987	1989	1990	1991	1992	1993	1994	1995
(% of GDP)											
Education	4.10	4.8	5.5	4.7	2	5.1	4.8	4.7	4.4	5	4
Health	4.40	4.4	4.7	3.5	4.4	5	4.2	4.2	3.9	4.4	4.1
Housing	0.9	1.3	0.9	0.4	0	0	0	0	0.3	0.2	0
Others	0.7	0.6	1.1	0.8	0.8	1.3	1.2	1.5	2.2	2.3	1.2
Total Social Spending	10	11.1	12.3	9.4	8.1	11.3	10.3	10.3	10.9	11.9	9.4
Total Public Spending	28.7	48.1	50.2	35.9	29.9	34.8	25.8	25.5	23.7	25.1	18.7
(% of Total Public Spending)											
Education	14.2	10	11	13	9.8	14.6	18.8	18.3	18.7	19.9	21.5
Health	15.3	9.2	9.4	9.7	14.7	14.3	16.4	16.3	16.7	17.5	22
Housing	3.2	2.6	1.8	1.2	0	0	0.1	0.1	1.4	0.7	0.1
Others	2.3	1.3	2.1	2.2	2.7	3.6	4.7	5.7	9.1	9.4	6.5
Total Social Spending	35	23.2	24.4	26.1	27.2	32.5	40	40.4	45.9	47.5	50.1
(In 1987 US$ Per Capita)											
Education	57.3	66.8	67.9	52.9	27.7	46.6	42.7	40	36.1	40.5	32.7
Health	61.7	61	57.9	39.7	41.5	45.7	37.3	35.5	32.2	35.6	33.4
Housing	13.1	17.5	11.3	4.8	0	0	0.1	0.1	2.7	1.5	0.1
Others	9.3	8.5	13.2	9.1	7.8	11.6	10.8	12.5	17.7	19	9.8
Total Social Spending	141.3	154	150.2	106.6	77	104	90.9	88.1	88.6	96.6	76.1
(In real per capita prices 1980 = 100)											
Education	100	92.2	81.1	19.2	8.9	101.3	14.6	13.6	12.3	14	11.3
Health	100	78.2	64.1	13.4	12.4	92.2	11.8	11.2	10.2	11.4	10.7
Housing	100	106	59	7.7	0	0	0	0	0	0	0
Others	100	72.4	96.6	20.3	15.4	155.6	22.7	26.2	37.1	40.5	20.9
Total Social Spending	100	86.1	72.7	15.6	10.1	91.5	12.6	12.1	12.2	13.5	10.6

Source: R. Cominetti and G. Ruiz, "Evolución del Gasto Público Social en América Latina: 1980-1995", *Cuaderno de CEPAL*, November 1996. Based in data from Ministry of Finance

At this time prices and the commercialization of agricultural goods were liberalized, but the elimination of the exchange rate subsidy gradually undermined the manufacturing sector which began to rapidly contract. As a result urban poverty and unemployment began to increase rapidly.

The liberalization of prices and the reevaluation of the use of macroeconomic policy instruments that took place in February 1985, together with the macroeconomic deficits that were maintained in spite of all intentions, were the underpinnings of the inflationary development that Nicaragua would experience in subsequent years. The inflation rate rose from an annual average of around 30 percent for the 1980-84 period to ranges of 300 percent, 700 percent and 1,300 percent from 1985 to 1987, respectively.

The Reform of 1988, a major shift in Policy: The country entered then another short lived adjustment program in February of 1988 that included a change of currency. However, the inconsistency of trying to achieve a foreign exchange rate adjustment and to stop inflation while having a large fiscal deficit triggered hyperinflation. Cumulative inflation exceeded 33,000 percent in 1988 (Table 4.3). Exports bottomed out at US$230 million, their lowest point in over fifteen years, and the real exchange rate lost more than 90 percentage points with respect to its 1980 level. The economy contracted 12.4 percent, its sharpest drop after the 1979 uprising.

The 1988 economic reforms however, finally marked a shift in policy as the program was corrected in the second half of the year after disappointing initial results particularly with regards to inflation. At the time, a definitive reappraisal of traditional macroeconomic policy instruments took place. Clarity was also gained about the policies required to wrestle with hyperinflation and the move was

made to completely liberalize prices, eliminate subsidies and increase rates for public services. The objective was to stimulate production and control excessive spending that pressured price stability. By 1989, the fiscal deficit was more under control and helped to reduce the rate of inflation, although not sufficiently to overcome continuing hyperinflation that taxed the poor, especially those who depended on fixed incomes.

The second adjustment program launched in the second half of 1988 thus emphasized financial-monetary discipline, price liberalization, preeminence of the traditional macroeconomic policy instruments and the strengthening of market mechanisms as a whole. Cumulative inflation thus dropped from 33,000 percent in 1988 to 1,700 percent in 1989. The fiscal deficit in turn dropped from 27.6 percent of GDP to only 2.6 percent. Economic growth was 1.7 percent. All this however, ended up producing social dislocations insofar as these abrupt changes in the policy framework significantly impacted the real sector of the economy.

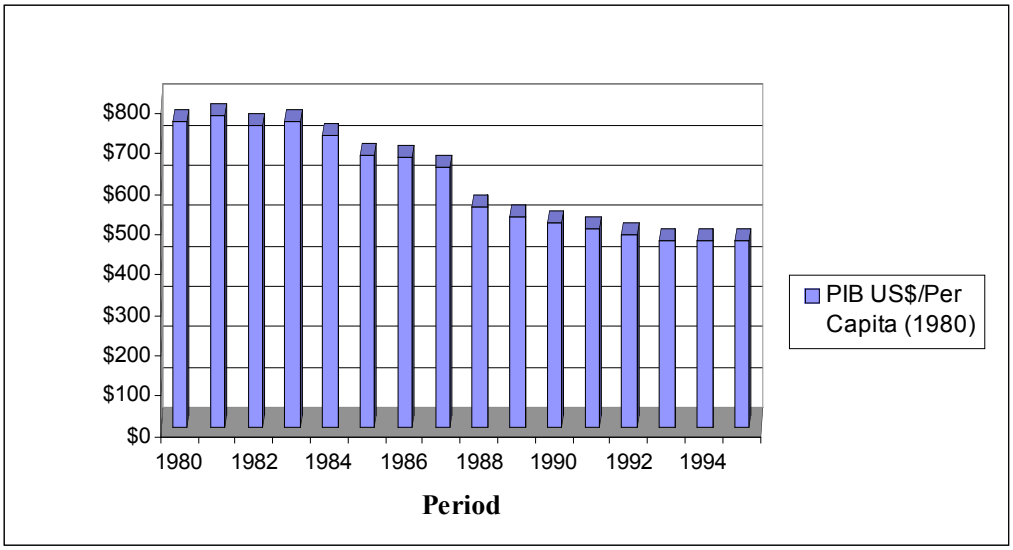
In summary, the contraction of the country's economy in general triggered growing unemployment and underemployment levels which reached 40 percent of the economically active population in 1989 (Table 4.2). On the monetary side, growing excess demand and economic contraction deteriorated real wages as inflation and hyperinflation grew, loosing 72 index points with respect to the level of 1980 by 1989. Social spending lost 90 index points with respect to 1981.

The contraction of production was uneven but significant, first affecting the

agricultural sector, and later the manufacturing sector, consequently the increase in poverty originated, as was shown in the previous chapter, in equal measure from the rural and urban sectors. Because the agricultural and manufacturing sectors along with the commercial sector account for the greatest share of GDP in the economy the impact on the economy of production contraction in these sectors was considerable.

In the first half of the eighties overall average growth was only 1 percent, while in the second half of the decade growth contraction averaged 6 percent. On a per capita basis, this represented a significant deterioration in real terms as population was growing at a rate of around 3 percent a year. By the end of the decade annual per capita income had declined to around US$ 500 (Figure 4.2).

Figure 4.2: PIB US$/Per Capita (1980)



Source: Banco Central de Nicaragua

The overall impact of this large sector realignment was large-scale social dislocation which led the increase in poverty suffered during the period as the government made repeated but unsuccessful attempts to adjust the economy. A large part of the responsibility for this outcome is shared by the implementation of misguided government economic policy worsened by the war during the eighties. Therefore, this experience warns of the fragility of macroeconomic performance and the importance of prudent and sound economic management.

Macroeconomic Policies in the Nineties

In 1990, a major change occurred in Nicaragua's political system with the rise to power of the elected government of Violeta Chamorro. The private sector became again the focal point of capital accumulation rather than the state. In turn, the government sought to stabilize the economy to reactivate private investment and sought the assistance of multilateral lending institutions to obtain fresh foreign resources to resume growth.

From 1990 to 1996 the Chamorro government achieved economic stability. However, economic growth only resumed during the last part of the administration. An orthodox adjustment policy package was adopted to gain the support of the International Monetary Fund (IMF) and the World Bank. The adjustment was particularly severe for sectors of manufacturing, including small and medium businesses, the public sector and even the commercial sector, although to a lesser

degree.

The restoration of a price system that reflected real economic constraints and the country's articulation into the international economy were key elements which played a role in the abrupt realignment that the productive sectors faced in the nineties. This process and the fiscal contraction that accompanied it caused unemployment and underemployment to rise to unprecedented levels. By 1993 unemployment affected 21.8 percent of the economically active population while underemployment exceeded 50 percent. Social spending dropped in per-capita terms throughout the period. Economic growth remained stagnant in the first part of the nineties.

The economic conditions at the beginning of the administration were complex. The country had experienced an extended period of economic stagnation and contraction since 1984, including severe distortions in the price system and faced undefined property rights on urban lots, rural lands and nationalized companies.

In 1990 the per-capita GDP was US$500, about half of its 1980 level. At over US$10 billion, the country's debt was the highest per-capita debt in the world. Nicaragua faced an external gap that required a billion dollars to cover the trade deficit and foreign debt service in 1990. In addition, open unemployment was five times greater than it had been in 1981. By 1989 per-capita social spending had fallen to US$77, half of the 1981 spending level (Table 4.4). The impact

of the adjustment process during the nineties mainly affected the urban sectors.

With the 1990 change of government monetary-financial discipline eventually was restored and became a key element of national economic policy. In terms of structural reforms, the orientation towards a market economy and a rapid process of privatizing government enterprises was established. By the end of the Sandinista revolution state ownership was around 30 percent of GDP.

The process of opening up and liberalizing the economy also deepened. The exchange rate was unified and quantitative import barriers and export taxes were removed. All state import and export monopolies were eliminated, and the ceilings on import tariffs were reduced from over 60 percent in 1990 to about 20 percent in 1995. This process led to an additional contraction in manufacturing as protection was drastically reduced and the foreign exchange rate was no longer subsidized. Most domestic price controls were removed except for public utility services, selective petroleum products, milk and basic medicines.

Economic policy went through three phases between 1990 and 1993. The Mayorga Plan[60] brought another currency change in 1990 and one-to-one parity with the dollar. Despite intentions, the fiscal deficit expanded from 2.6 percent in 1989 to 15 percent in 1990 (Table 4.7), and cumulative inflation skyrocketed once again from 1,700 percent to 13,400 percent in this period (Table 4.6). The country also

[60] Francisco Mayorga was the Chamorro government's first Central Bank president and coordinated economic policy until his resignation due to internal discrepancies at the end of 1990. He was responsible for the introduction of the Córdoba Oro.

suffered from political instability, facing two national strikes that meant important economic losses. One significant achievement of the new government's first year, however, was that at least the economy did not continue to decline.

To some extent Mayorga's economic program showed elements of continuity with the adjustment process initiated by the previous government. Two important differences were that the restrictive fiscal policies would be based on cutting military spending and tax reform in favor of increased social spending.

The relationship of social spending to the GDP improved with respect to the previous year, increasing from 30 percent of GDP in 1989 to 35 percent in 1990. In general, the proportion of social spending to total government spending in subsequent years was substantially greater than during the Sandinista government. Average total social spending during the Sandinista period was about 27 percent of total government expenditures. In the nineties, as a result of the peace dividend, this share increased to an average of 42.7 percent from 1990 to 1995 (Table 4.4).

On a per-capita basis however, social spending continued to deteriorate dropping to around half of what was spent per capita in the eighties. Just between 1990 and 1995, per-capita social spending dropped further, from US$104 in 1990 after increasing from US$77 in 1989 to US$76.1 once again in 1995 as a result of the adjustment program undertaken in 1994 under IMF supervision (Table 4.4). A combination of population growth, GDP contraction and the need to adjust macroeconomic balances explain the evolution of social spending and its

implications to poverty and living standards in the country in the first half of the nineties.

The new stabilization and adjustment package introduced in March 1991 known as the "Lacayo Plan" had marked heterodox features.[61] It included a 600 percent currency devaluation with a 200 percent wage adjustment for the public sector, the exchange rate was anchored to stabilize prices, a commitment was made to reduce public spending and the deficit was financed with foreign resources. Military spending and domestic credit were also drastically reduced. The program included an income policy, which selectively regulated certain basic goods prices. A transition was designed toward positive interest rates and their high level reduced the liquidity in the economy, which contributed to the success of the anti-inflationary program.

[61] For more details on economic policies from 1990 to 1995 see Arana (1997). For emphasis on macroeconomic aspects and foreign cooperation see Vos (1994).

Table 4.5 Macroeconomic Indicators 1990-1995

	1990	1991	1992	1993	1994	1995
Population (000)	3,679	3,789	3,902	4,017	4,019	4,139
GDP Million US$	2,394	2,350	2,373	2,369	2,455	2,548
Real GDP Million US$	1,814	1,811	1,818	1,810	1,871	1,952
GDP US$/Per Capita (1980)	508	492	480	465	466	466
Growth.% GDP	0	-0.2	0.4	-0.4	3.3	4.3
Rate of Inflation						
Annual Average (%)	7,485	2,945	27.7	30.1	7.8	11
Annual Accumulated (%)	13,490	865.6	9.9	25.4	11.2	15.3
Underemployment (%)	44.3	52.2	50.3	50.1	53.6	52
Salary Index 1980 = 100	60	100***	119	110.5	116.2	113.2
Real Exchange Rate 1980 = 100	32.1	27	25.9	24.8	25.4	26
Trade Balance	306	479	632	477	524	491
Exports	331	272	223	267	351	458
Imports	636	751	855	744	875	949
Current Account Balance	304	8*	716	483	533	991
External Debt	10,716	10,313	10,792	10,987	11,700	10,242
External Debt Service**	52	616**	105	199	252	324**
Debt Renegotiated	19	1,059	159	156	362	NA
Accumulated Arrears	4,034	3,305*	4,367	5,060	6,284	6,975
International Reserves Mill. US$	112.5	123.5	128.6	49.4	105.2	85

Sources: Banco Central de Nicaragua, Instituto Nacional de Estadísticas y Censos, Ministerio de Finanzas, Ministerio de Economía y Desarrollo and Ministerio de Cooperación Externa

(*) It includes US$ 1.4 million transfer from debt forgiveness.

(**) In 1991, a payment of US$ 305 million to multilateral organizations is included. US$ 636.6 million renegotiated in 1995 is not included, but US$ 89 million of commercial debt are included

(***) Based on reestimations by the Ministerio del Trabajo

Hyperinflation, which surpassed 13,000 percent in 1990, was placed under control by April 1991. Cumulative annual inflation for 1991 was 860 percent, but taking just the April-December period, it was only 8 percent. Price stability produced gains in real wages which improved 13 percentage points by 1995 compared to 1991 (Table 4.5). The exchange rate, however, while it gained stability did not recover the levels enjoyed in 1980 and remained overvalued thereby

affecting export performance.

A counter intuitive finding is that getting inflation under control by 1991 did not seem to lead to a reduction in poverty indicators.[62] Evidence from the surveys under analysis, as well as studies on urban poverty conducted in the nineties, indicate that poverty continued to grow even after inflation was brought under control. Two hypotheses emerge from this. One is that the economic contraction's negative impact seems greater than the real benefits obtained by sectors dependent on fixed incomes. The other is that this is possible because of the high informality (70 percent in 1993) of the Nicaraguan labor market structure, where the share of the wage sector and of sectors with fixed incomes is small and wage indexed incomes dominate instead. The most important impact of controlling inflation thus seems to have been reactivating private investment, which was eventually accomplished by the mid nineties, and generating productive employment rather than readjusting income distribution.

In 1992, a rise in current government spending due to wage increases in the public sector led to the suspension of the "Stand-by" agreement that had been signed with the IMF for the 1991-93 period. As a result of internal political conflicts, the availability of foreign resources from bilateral cooperation also dropped in 1992. Furthermore, exports for 1992 felt to US$223 million, the lowest level in the last 20 years, which brought a significant hard currency crisis in 1993.

[62] Analysis on inflation and poverty have found a strong relation between the two. See Cardoso (1992).

Table 4.6 Macroeconomic Relationships in Percentages 1990 – 1995

	1990	1991	1992	1993	1994	1995
Exports/GDP	27.4	23.3	27.9	30.5	29.9	31.4
Imports/GDP	31.1	36.3	35.9	32.4	31.9	33.4
External Debt/Exports.	3241	3786	4837	4108	3331	2237
External Debt/GDP	456	439	454.8	461.8	476.6	402.2
Arrears/Exports	1220	1213	1957	1892	1789	1523
Arrears/GDP	172	141	184	212.7	256	273.8
Investment/GDP	13.5	15.1	14	11.7	12.3	14
Fiscal Deficit/GDP	15	7.9	8.3	8.6	12.1	9.7
Fiscal Revenue/GDP	17.7	24.5	27.9	29	29	29.5
Fiscal Expenditure/GDP	38	32.4	36.2	37.6	41	41
Liquid Assets/GDP	6.1	12.2	11.9	10.7	14.9	15.1
M1	4.8	9.7	9.1	7.3	8.8	8.6
M2	3	5.4	5.1	4.6	5.5	5.3
M3	1.3	2.4	2.8	3.4	6.1	6.5

Sources: Banco Central de Nicaragua, Instituto Nacional de Estadísticas y Censos, Ministerio de Finanzas, Ministerio de Economía y Desarrollo and Ministerio de Cooperación Externa

Even though inflation was eliminated, economic stagnation continued throughout the 1991-93 period. The economy did not recover until 1994. The agricultural sector in general started growing in the 1991-93 period as the war faded in the countryside. But this was counteracted by the contraction of both the industrial sector-given the growing opening up of the economy-and the public sector given the need to reduce fiscal deficits. The contraction of manufacturing was a process that began in the last part of the eighties. This had an impact particularly in the increase in urban poverty, especially in the capital since most manufacturing and public sector activity occurs in Managua.

Much of the liquid foreign resources that entered the country in that period were used either to make debt payments, or, since they were fungible, to import

consumer goods rather than for investment. Private investment, in turn, remained low given the uncertainty and the country's deficient infrastructure. Direct foreign investment began to gain some significance after 1994, and domestic private investment gradually tended to accelerate its share in total investment.

In 1993, however, the foundation was laid for the signing of a structural adjustment agreement that began in April 1994 under IMF supervision and allowed the country to increase the availability of foreign resources. At that time a new exchange policy was adopted through a twenty percent devaluation and a system of daily, pre-announced slides in the exchange rate, opening the way to a more dynamic exchange rate policy.[63] This devaluation occurred within the framework of a broader set of economic policies that sought to halt the continual balance of payments deterioration and stalled economic growth.

Nonetheless, the stagnation continued in 1993 and the devaluation bore the bulk of the adjustment effort since complementary measures were not taken on the monetary and fiscal side. Given that the agreement with the IMF was not signed until April 1994, international cooperation dropped significantly, international reserves fell and inflation climbed back up to 20 percent.

With the signing of the adjustment program in 1994, balance of payments support was obtained potentially for three years. The environment of macroeconomic stability that had been established to a large degree succeeded in

[63] The sliding policy that was established then and was still in effect by mid 1997 results in an annual nominal devaluation of 12 percent.

changing the expectations of investors and the economy in general began to respond in a sustained manner. In 1994 economic growth was 3.3 percent and 4.3 percent in 1995. Exports climbed from US $350 million in 1994 to US$490 million in 1995, the result not only of favorable prices in coffee, but also the result of the dynamic growth of nontraditional export sectors such as fishing and mining.

In general terms, the reactivation was bolstered by the primary sector and by agriculture in particular, which was the most dynamic one, but new emerging sectors became important and contributed to a reduction of open unemployment.

Despite the fact that the severe adjustment program of the first half of the nineties entailed high social costs, a series of positive trends began to develop in 1994 for the urban sector, once the economic reactivation process began. On the one hand, the manufacturing sector joined other sectors in a recovery phase albeit more slowly than the agricultural sector. Employment increased in the formal sector and at a greater rate than in the informal sector. In turn, the employment index in the private sector increased systematically, and while wages remained constant, incomes rose in households with more family members holding occupations in the private sector. This outlook was consistent with expected reductions in poverty levels once economic growth takes place.

In conclusion, the first part of the nineties, as a result of the need to drastically reverse previous policies, brought hardship to the economy and to poor sectors in particular. The adjustment programs that were undertaken reduced

social and government spending in general and modified relative prices, which thereby caused the restructuring of the productive sectors. The process negatively affected the industrial and the public sectors in particular thus negatively affecting employment levels in urban areas.

The evidence does indicate that while urban poverty was increasing by 1993, rural poverty was decreasing in the first part of the nineties, although it stood at a level almost twice as large as urban poverty. This is particularly important in order to consider the growth prospects of the economy, as it was emerging from a process of adjustment and in order to consider the policy mix to which poverty levels would be more responsive in the second half of the nineties.

Perspectives for Growth and Poverty Reduction in the Mid Nineties

By the mid nineties once again, Nicaragua's challenge was to sustain the economic growth which started in 1994 after more than ten years of contraction or stagnation. At the same time, the challenge was to reduce the levels of poverty. Under these circumstances, a decomposition analysis like the one developed in this dissertation provides a useful tool for evaluating policy options, especially in the context of the need to continue adjusting macroeconomic balances.

The poverty profile analysis indicated that rural poverty was larger than urban poverty during the period 1985-1993. Also, by 1993 both sectors had contributed to the increase in poverty in almost the same proportion, although

urban poverty had increased more rapidly than rural poverty. The most affected sectors from a productive point of view were agricultural and manufacturing activities as a result of policies implemented and various internal and external shocks. From the labor side, subsistence agricultural workers and self employed mainly from the cities were the most affected.

In this context, it is relevant to consider Field's[64] characterization of growth models in terms of poverty and equity considerations. According to Fields, among the various growth models one can distinguish "enlarging of the modern sector", "enriching of the modern sector", and "enriching of the rural sector". Of all these, only the last one is unambiguously pro-poor, especially in those cases in which poverty is concentrated in the rural sector.[65]

In terms of sector policies in this context and considering the weight of rural poverty, it is important to take into account that in an effort to assure cheap foodstuffs for the urban sectors, economic policies have tended to have an anti-rural/agricultural bias in Nicaragua. These policies predominated in the sixties and seventies and even though the political social base of the Sandinista Administration was made up of poor peasants from the countryside, the same types of policies predominated in the first half of the eighties.

The second half of the eighties was largely affected by the war which

[64] Fields (1980)

[65] For a discussion of this theme please see Lipton and Ravallion (1994).

brought a sharp contraction in land under cultivation, even though agricultural prices were liberalized and the terms of trade of the rural sector improved considerably with respect to the urban sector. The net outcome was that overall poverty increased in the countryside. This fact in turn aggravated the conditions of the urban sectors through the pressure on services that rural-urban migration generates. The collapse of manufacturing and the simultaneous contraction of the public sector explained the increase in urban poverty as well as higher prices of agricultural products.

In Nicaragua, therefore, as in most developing countries, it is clear that resolving the problem of poverty must take place by improving the living and working conditions and the income of the rural poor as a first step in order to have the largest possible impact in terms of overall poverty reduction. In terms of macroeconomic policies, however, until very recently, scant attention was given to the theme of poverty in the context of adjustment programs in the eighties and nineties in developing countries.

The next chapter presents a policy simulation exercise in which alternative adjustment policies are analyzed taking 1994 as a base. A general equilibrium model consisting of four social classes and two productive sectors simulates alternative policy options over the following seven years illustrating the gains and costs associated with a strategy which places emphasis on the development of the rural sector compared to an orthodox adjustment package.

Chapter 5: Alternative Adjustment, Agricultural Based Growth and Poverty

This chapter deals with alternative strategic policy simulations applied to the Nicaraguan economy. The policy analysis consists of simulating and comparing the tradeoffs of an *orthodox adjustment program* with a *pro-agricultural based strategy*. A dynamic applied computable general equilibrium (CGE) model with two sectors and four social classes addresses how these two alternative strategic policy options impact the income of urban and rural capitalists and workers. Macroeconomic balances are also analyzed in order to determine the sustainability of each option in the medium to long term.

This dissertation relies on a stylized numerical model for the comparison of these alternative strategic policy options. Stylized numerical models are more complex than analytical models as wider applicability is desired. While they tend to stay close to their underlying analytical model, in this case the goal is to explore particular causal mechanisms, to gain an order of magnitude and the direction of the impact on income distribution and poverty of alternative policies considering a specific numerical structure of the Nicaraguan economy. These models are a good complement to other forms of partial analysis.[66] At the same time, the small size of stylized numerical models allows to keep track of the dynamics of the model. The limitation however is that there are a number of variables and sectors which are not taken into account as it would be the case with a more dissaggregated model.

[66] For a detailed discussion on the taxonomy of CGE models see Robinson (1989)

The alternative policy analysis is important in the case of Nicaragua and developing countries in general, as the advice given by donors and multilateral agencies has aimed at achieving two goals: shifting resources towards tradable goods and improving the efficiency of resources. To achieve these goals, orthodox set of policies are suggested, with surprisingly similar advises across countries. The standard policy package has consisted on nominal exchange devaluations to achieve a depreciation of the exchange rate, trade policy reform in which quotas are replaced by tariffs and average tariffs are lowered and made more uniform. Additionally, tax reforms placing emphasis in value added taxes are recommended by the typical orthodox adjustment package, as well as the removal of price distortions affecting tradable goods.

The goal in these packages is to achieve an outward orientation of the economy, in order to have better chances for development and to facilitate the servicing of foreign debts. Criticism to this standard package has emerged from different quarters.[67] The critique stresses the role of a country´s economic structure in determining the outcome. The argument is that trade liberalization may work in one country, but depending on the economic structure of a given country it might not necessarily work in another. Central to this line of criticism is the model of the economy that is under analysis as policies are proposed. The criticism reflects disagreement over the link between the instruments and targets of economic policy

[67] See Taylor (1990) and Devarajan et al., (1994)

or the model of how the economy actually works. To this context, multilateral financial institutions recently have added as a complement to adjustment programs poverty reduction strategies, which add more complexity to the goals that adjustment packages attempt to accomplish.

The model developed in this dissertation in this respect proposes a structure of the Nicaraguan economy based on the empirical reality of the country in the mid nineties, in order to contrast alternative strategic policy options. This is not an exercise in policy optimization as such, but the results obtained show contrasting outcomes of alternative strategic policies with an additional constraint being taken into account, which is to achieve a reduction in poverty and a better income distribution in the process of adjusting the economy.

The applied general equilibrium model is an extension of Devarajan, Lewis and Robinson (1994) and has structural features which complement the more traditional neoclassical optimizing behavior of economic agents from general equilibrium economic theory such as imperfect substitution between exports and the production of domestic goods, employment rigidities and a closure for investment which includes external savings as an exogenous variable.[68] The parameters of the model come from a Social Accounting Matrix (SAM) and are based on macroeconomic data from Nicaraguan National Accounts and the Living Standard Measurement Survey of 1993 as explained in more detail in a following section.

[68] Devarajan et al., (1994)

In general terms, the empirical findings are that orthodox adjustment programs while positive in the medium to long run in terms of economic growth can potentially harm the poor in the short run. As shown in the previous chapters the adjustment process in Nicaragua during the eighties and nineties had negative impacts in terms of income and poverty increases as well. The CGE simulations based on an orthodox adjustment program in this chapter also indicate that there would be negative impacts in terms of income for all social classes.

The more recent adjustment programs supported by multilateral institutions place an emphasis on growth and poverty reduction. In this context, the compensation programs promoted by multilateral institutions targeted to the poor are placing an emphasis on the protection of social and poverty related expenditures in national budgets in the design and support of economic adjustment programs. This is a result of the Highly Indebted Poor Countries Initiative (HIPC).[69] Thus, a valid empirical question is whether the protection of poverty related fiscal expenditures is sufficient to protect the poor from the negative impact of adjustment programs, or whether policy makers should support macroeconomic policies that favor broad sectors of the economy where poverty might be concentrated since

[69] In Cologne, Germany, in 1999 the developed countries launched the Highly Indebted Poor Countries Initiative (HIPC). This was made operational by the IMF through the Poverty Reduction and Growth Facility (PRGF). The facility supports debt forgiveness in exchange for reassigning debt service payments to poverty reduction related expenditures for highly indebted poor countries.

evidence indicates that the fastest increases in poverty are the result of macroeconomic shocks.[70]

In the case of a country like Nicaragua, and given the structure of poverty that existed in the nineties, special attention needs to be paid to the rural sector. In this context, a prescriptive poverty policy has to be concerned not only about economic growth, but the quality of growth and the nature of that growth. The quality of growth and the context where growth occurs affects poverty reduction. The World Bank (1990b) has argued that the labor intensity of growth makes it effective for poverty reduction, since labor is the most important endowment that the poor have.

Datt and Ravallion (1998) also have shown that the composition of sector growth is important for poverty reduction. For example, growth in the agricultural sector in terms of output per hectare contributes to trends in poverty reduction. This literature seems to suggest that the generality of orthodox adjustment programs needs to be complemented with policies conducive to improving the quality and growth of a specific sector.

This conclusion is also supported by the findings of Morley (1995) and Saudulet and De Janvry (1995) in their empirical analysis of the adjustment process in Costa Rica and Ecuador respectively. Their findings highlight the importance of

[70] For recent studies on the experience of Latin America in the nineties see Ganuza et al., (1998), Lustig (1995), Morley (1995) and Zevallos (1997).

examining the different sector impacts under adjustment in the rural sector as devaluation of the exchange rate for example, favor tradable goods and therefore the poor if they are rural agro-export producers.

Therefore, a working hypothesis of this chapter is that one way to offset the negative impact of adjustments for the case of Nicaragua is by favoring greater dynamic rural sector growth. This follows because poverty is concentrated in rural areas in Nicaragua and the country's tradable goods sector is primarily rural based and agricultural production is labor intensive. However, this has to be undertaken as a temporary policy option as there are distortions in relative prices and potential macroeconomic gaps to take into account in the medium to long term.

In this chapter the simulations show that a pro-agricultural strategy compared to an orthodox adjustment program causes larger deficits in the internal and external accounts. One way to offset these impacts in the short term and in the context of a poverty oriented reduction strategy is through a temporary increase in foreign aid in the form of budget or balance of payment support. Foreign aid enables a more gradual transition to adjustment. In theory, flexible foreign aid improves the current account which in turn appreciates the foreign exchange rate. Macroeconomic balance of payment support under these circumstances can have a broader impact when compared to the traditional forms of aid, which emphasize targeted development projects to help the poor that do not always necessarily translate into increased production and sustainable incomes for the poor.

An argument can be made, that by favoring a more dynamic growth of the rural sector, winners are being chosen, and that this reproduces the mistakes already made in the eighties when the country favored industrialization through import substitution. What it is argued in this dissertation is that for the sake of poverty reduction, a special attention to the development of the rural sector would be required in a country with the characteristics of Nicaragua. But, that at the same time, there are costs that need to be taken into account in terms of macroeconomic balances. Given the availability of foreign aid and the option of using it in the form of development projects as opposed to budget or balance of payment support, the latter would allow for a smoother adjustment process which in turn, could be used to favor the sector where poverty is concentrated in the short to medium term as the economy regains macroeconomic stability.

This approach has been neglected in adjustment programs up to the present. Instead, a neutral incentive scheme is recommended by the influential multilateral international financial institutions that support adjustment programs in developing countries.[71] Macroeconomic concerns are based mainly on pro-cyclical fiscal considerations. The HIPC Initiative while it supports poverty reduction as an integral part of adjustment programs has as its main innovation the protection of social and poverty related fiscal expenditures. In this dissertation, an active pro-

[71] For a description of the move to structural adjustment as the "orthodox" economic policy in developing countries in the eighties and nineties see Weaver (1995) and Williamson (1995). For prospects and challenges of structural adjustment programs see Schydlowsky (1995).

agricultural policy is advocated for countries where poverty is concentrated in the rural sector as supported by the simulation of alternative policy options. The effective possibilities of this approach depend on a good understanding of the underlying empirical realities of the country or the model of the economy in case, the specific options that may exist at a given point in time, the availability of flexible foreign resources, and the capacity to negotiate a good agreement.

The empirical analysis of the case of Nicaragua in this dissertation suggests that while there is no standard set of policies that apply to all circumstances, there are complementary alternative policies that at a given point in time can have a stronger impact in terms of incomes improvement and poverty reduction. In this sense, it is an approach that can potentially complement the new policy framework of multilateral financial institutions which place emphasis on the protection of poverty related fiscal expenditures during the adjustment processes. An understanding of the structure of the economy is required on a case by case basis to determine empirically the order of magnitude and the impact of alternative policies.

In general terms, an orthodox adjustment program and a pro-agricultural growth based strategy were the alternative options facing policy makers in Nicaragua during the second half of the nineties. At the core of these discussions was the role of agriculture in economic development.[72] Policy strategies for Nicaragua oscillated between state centered and market oriented development

[72] Timmer, p.7.

models in the eighties and nineties, yet adjustment programs disregarded micro considerations to promote the development of agriculture and the rural sector. In this chapter, the impact of a pro-agricultural policy mix is analyzed in terms of growth and the distribution of income between urban and rural sectors with poverty reduction being an important concern.

Agricultural Based Policies and Economic Growth in Nicaragua by the Mid Nineties

The economic growth strategy of Nicaragua during the mid nineties placed especial emphasis on the development of agriculture as a way to reduce poverty levels in the rural sector. At the time important discussions took place while looking at the different options in terms of policy alternatives. [73] A significant element of this strategy consisted of reversing the urban and rural terms of trade in favor of the rural sector. Empirical evidence indicated that the net effective rate of protection of the manufacturing sector (mainly an urban activity) in relative terms was greater than the protection of agricultural and agro-industrial products.[74] The overall result was diminished competitiveness for the whole economy. But above all, in social terms, rural poverty was the largest looser.

[73] In the Ministry of Agriculture and Forestry a number of policy documents were produced that outlined a pro-agricultural program in the context of adjustment measures. For a detailed discussion see Ministerio de Agricultura y Ganaderia (1997).

[74] See Berlinski (1995)

A pro-agriculture growth strategy, therefore, had to be based on the reduction of production costs and increases in productivity in the agricultural sector. In the long run, the development of factor markets such as land, financial services and technology was part of the strategy considered. However, short and medium term alternatives mainly consisted of adjusting tariffs, devaluating the exchange rate and increasing public spending.

In this respect, the establishment of tariff exemptions for intermediate agricultural and capital inputs, temporary increases in the protection of important basic crops and agro-industrial products and a tariff reduction for non-agricultural consumer goods were part of the options that were available to policy makers. A devaluation of the exchange rate and an increase in public spending in rural infrastructure were also part of the mix of policies to consider. A structural adjustment program in this same context had to take into account, the need to reduce government spending and tariffs for all goods, increase taxes and devalue the exchange rate to improve the overall current account balance.

The simulations presented deal with these alternative policy options for the short and medium term and compare economic growth under a different mix of policies. Additionally, the evolution of sector income growth, inflation, the current account deficit and increased foreign aid are analyzed and compared in the context of the concerns over poverty and the need to adjust and strengthen the economy.

A General Equilibrium Model for Nicaragua and the Social Accounting Matrix

In order to analyze the different policy alternatives discussed above a seven year dynamic general equilibrium model is used, which is an extension of the model by Devarajan, Lewis and Robinson.[75] For the Nicaraguan case, these simulations are primarily based on models and a social accounting matrix developed by De Franco,[76] relying on an input-output matrix produced by the Nicaraguan Central Bank in 1990, and calibrated with 1995 national accounts data in millions of córdobas, the national currency (Appendix A).

The social accounting matrix (SAM) provides information on income and expenditures of two productive sectors and four different types of economic classes, workers in the urban and in the rural sector and urban and rural capitalists. Consumption shares are based on the 1993 Living Standard Measurement Survey.[77] The social accounting matrix includes information about government revenues differentiating between tariffs and direct and indirect taxes. Transfers to private individuals and savings are taken into account. Finally, the social accounting matrix includes exports and imports of goods and services and information on debt service in order to analyze the evolution of the current account balance.

[75] Devarajan et.al. (1994)

[76] De Franco (1988) and De Franco (2001)

[77] Instituto Nacional de Estadisticas y Censos (1995).

The two productive sectors are "agriculture" which includes agro-industrial production and "other sectors of the economy" which include manufacturing and services. To better portray the Nicaraguan economy the labor market in the model does not assume full employment.[78] Given Nicaragua´s dependence on foreign resources, foreign debt payments are included in the income of the different economic social classes. Specifically in this model, debt payments have an impact on savings and consumer consumption.[79]

Production

Consider a small open economy with domestic production at time t, determined by a constant elasticity of transformation CET production function utilizing labor and capital. With *i* being the specific sector (agriculture or rest of the economy) from which output is determined.

$$XQ_{i,t} = AV_i \left[BV_i * L_{i,t}^{-\rho_i} + (1 - BV_i) * KF_{i,t}^{-\rho_i} \right]^{\frac{1}{\rho_i}} \qquad (1)$$

where

$XQ_{i,t}$ is local output of sector *i* at time *t*.

AV is a parameter of the transformation function for each sector

BV is a share parameter for capital and labor

[78] A number of specific structural features of the Nicaraguan economy rely on Taylor's approach to underdeveloped economies (Taylor, 1990).

[79] The computer program and the simulations presented in this chapter were written using General Algebraic Modeling System (GAMS) and the code is shown in Appendix B.

L is the stock of labor used

KF is the stock of capital used

ρ is the transformation elasticity between the inputs for production. Note that model specification can allow output and technological parameters to vary across sectors i.

Profit maximizing leads to first order conditions, from which the demand for capital and labor can be obtained as functions of the relative prices. As shown on Annex A, these conditions are explicitly incorporated into the model.

Once output is obtained, it can be destined for local demand or can be exported. The fact that both types of outputs are not exactly the same is depicted by a constant elasticity of transformation (CET) function,

$$XQ_{i,t} = AT_i\left[BT_i * E_{i,t}^{-\rho t_i} + \left(1 - BT_i\right) * D_{i,t}^{-\rho t_i}\right]^{\frac{1}{\rho t_i}} \quad . \qquad (2)$$

where

$AT_{i,t}$ is a shifting parameter of the transformation function.

$BT_{i,t}$ is a share parameter of transformation between export output and output for local consumption.

$E_{i,t}$ is export output of sector *i* at time *t*.

$D_{i,t}$ is output destined to local consumption of sector *i* at time *t*.

ρ is the transformation elasticity between export and domestic.

In other words, in order for a locally produced good to be destined for either local or export markets, it must be transformed accordingly. Practical examples of these transformation includes specific export requirement such as packaging that products must face in order to be exportable.

From the optimization of function (2), first order conditions are also obtained, which can be used to obtain the corresponding decision to export or to produce for the domestic market. As expected, this decision is determined by relative prices. From the first order conditions, optimized values are obtained and the value of total supply of sector *i* is the sum of exports and domestic production, multiplied by their corresponding prices, which for the case of local production is an endogenous variable to be determined by the interaction with aggregate demand, which will be explained in the next section.

$$PQ_{i,t} * XQ_{i,t} = PD_{i,t} * D_{i,t} + PE_{i,t} * E_{i,t} \qquad (3)$$

where

$PQ_{i,t}$ is the price of the locally produced good of sector i at time t.

$PD_{i,t}$ is the price of output destined to local consumption.

$PE_{i,t}$ is the price of output destined to export consumption.

Market clearing conditions, which are explained below, determine the local price levels PQ, PD, and PE.

Demand

Aggregate demand in this open economy is determined by a constant elasticity of substitution function between imported and locally produced goods such that

$$X_{i,t} = AC_i \left[BC_i * MC_{i,t}^{-\rho c_i} + \left(1 - BC_i\right) * D_{i,t}^{-\rho c_i} \right]^{\frac{1}{\rho c_i}} \qquad (4)$$

where

$X_{i,t}$ is aggregate demand, as a function of imported and locally produced goods.

AC is a change parameter of the consumption function,

BC is a share parameter which relates to the different consumption goods.

MC is the imported consumption good,

ρc is the transformation elasticity between the imported consumption good and the domestic good.

From the optimization of the consumption functions the demand for both goods (local and imported) are derived from the first order conditions, which interact with the corresponding relative prices. The total demand of goods is the sum of local demand $PD_{i,t} * D_{i,t}$, plus imports $PMC_{i,t} * MC_{i,t}$,

$$P_{i,t} * X_{i,t} = PD_{i,t} * D_{i,t} + PMC_{i,t} * MC_{i,t} \quad . \qquad (5)$$

where

$P_{i,t}$ is the aggregate demand price level.

$PD_{i,t}$ is the price of output destined to local consumption.

$PMC_{i,t}$ is the externally determined price of imports.

From the interaction between equations (3) and (5), it is clear that a single price level emerges, which is determined by local markets, as the price of exports in the supply schedule and the price of imports form the demand side are exogenous.

Prices

As mentioned above, market clearing conditions for local markets determine the local price level *PD* in each sector and time. For imported domestic prices of consumer, intermediate and capital goods, prices are determined by the exogenous international price for these goods, multiplied by the exchange rate ER_t and their corresponding import tariffs. Therefore, for the domestic prices of imported intermediate inputs the equation is

$$PMN_{i,t} = PWMN_{i,t} * ER_t * (1 + TMN_{i,t}). \quad (6)$$

where

$PMN_{i,t}$ is local price for intermediate imported goods

$PMWN_{i,t}$ is international price for intermediate imported goods.

ER is the nominal exchange rate at time t.

$TMN_{i,t}$ is the local tariff for imported intermediate goods.

The domestic prices for imported consumer and capital goods are similarly determined.

The domestic price for exported goods is a function of their international price, times the nominal exchange rate. This price can also be affected by any subsidy or export tax,

$$PE_{i,t} = \frac{PWE_{i,t} * ER_t}{(1 + TE_{i,t})} \quad . \tag{7}$$

where

$PE_{i,t}$ is local price for export goods

$PWE_{i,t}$ is internationally determined price for export goods

$TE_{i,t}$ is local tax or subsidy for export goods

Final consumer prices PC are a function of producer prices $P_{i,t,}$ times the corresponding consumption sales tax $TXC_{i,t}$,

$$PC_{i,t} = P_{i,t} * (1 + TXC_{i,t}) \quad . \tag{8}$$

The price for capital goods at each sector are formed according to the next equation,

$$PK_{i,t} = \left(1 + TXI_{i,t}\right)\left[P_{i,t} * AK1_i + PMK_{i,t} * AK_i\right]. \tag{9}$$

where

PK $_{i,t}$ is local price for capital goods at time t and for sector i.

TXI $_{i,t}$ is the local tax or subsidy for capital goods.

P $_{i,t}$ is price for local capital goods

PMK $_{i,t}$ is the international price for imported capital goods

AK1 $_{i,t}$ local component of the price for capital goods

AK1 $_{i,t}$ external component of the price for capital goods

In other words, capital prices have a domestic component given by $P_{i,t}$*$AK1_{i,}$ and also depend on an imported component $PMK_{j,i}$*AK_i. $TXI_{i,t}$ is the tax or investment subsidy.

Income

Gross income *YH* of class *k* at time *t*, is the sum of profits, salary income, both of which account for factor payments, plus government transfers and foreign remittances,

$$YH_{k,t} = \sum_i (1 - SH_i) * RK_{i,t} * KF_{i,t} + \sum_i WA_t * WDIST_i * L_{i,t} + IPC_t * GTRS_{k,t} + ER_t * REMIT_{k,t} \quad (10)$$

where (1-SH_i) is the share of each business sector i,

RK is capital return,

WA is national average salary,

WDIST is the salary difference of sector i from the national average,

L is the quantity of labor used,

IPC is consumer price index

GTRS is government transfers and

ER is the nominal exchange rate at time t

REMIT is foreign remittances.

The specification of this income function lets the impact from policies and other changes be seen in terms of income distribution per social class.

Total income Y for social class *k* is gross income less the amount paid as income tax, which has a tax rate *TY* for each class at every point in time.

$$Y_{k,t} = \left(1 - TY_{k,t}\right) * YH_{k,t} \quad . \tag{11}$$

Consumption

Total national consumption is a function of the marginal propensity to consume $Q_{i,k}$ and net income. And this income, is net of foreign debt payments as it was previously explained,

$$PC_{i,t} * C_{i,k,t} = Q_{i,k} * \left(Y_{k,t} - SHX_t * RWI_t * DEBT_t * ER_t\right) \tag{12}$$

where

PC is final consumer prices

C is consumption

SHX_t represents debt payments by all social classes.

RWI is the interest rate on foreign debt.

DEBT is total foreign debt.

Fiscal Revenues

Total fiscal revenue in each period comes from aggregating the different sources of revenues,

$$TAX_t = TAXAC_t + TAXAG_t + TAXAI_t + TAXB_t + TAXC_t + TAXD_t + TAXE_t + TAXF_t \quad (13)$$

.

where

TAX is total tax revenues

TAXAC is tax revenues from the value added tax

TAXAG is tax revenues from government activities

TAXAI is tax revenues from investment activities

TAXB is tax revenues from imports

TAXC is tax revenues from exports activities

TAXD is tax revenues from personal income

TAXE is revenues from foreign transfers to the government

TAXF is revenues from public enterprises

Fiscal revenues are made up consumption taxes paid by the different social

classes, urban and rural entrepreneurs and urban and rural workers,

$$TAXA_t = \sum_i TXC_{i,t} * P_{i,t} * \left(\sum_k C_{i,k,t} \right) . \quad (14)$$

The government also pays taxes on its expenditures,

$$TAXAG_t = \sum_i TXG_{i,t} * P_{i,t} * GK_{i,t} \quad . \quad (15)$$

The variable $TAXB_t$ is total fiscal revenue which comes from consumer goods and intermediate and capital inputs import tariffs,

$$\begin{aligned} TAXB_t &= \sum_i TMC_{i,t} * ER_t * PWMC_{i,t} * MC_{i,t} \\ &+ \sum_i TMN_{i,t} * ER_t * PWMN_{i,t} * MN_{i,t} \\ &+ \sum_i TMK_{i,t} * ER_t * PWMK_{i,t} * MK_{i,t} \end{aligned} \quad (16)$$

where

$TMC_{i,t}$ is the tariff on imported consumer goods,

$PWMC_{i,t}$ is the international price of consumer imported goods,

$MC_{i,t}$ is total imported consumer goods,

$TMN_{i,t}$ is the tariff on imported intermediate inputs,

$PWMN_{i,t}$ is the international price of imported intermediate inputs,

$MN_{i,t}$ is total imported intermediate inputs,

$TMK_{i,t}$ is the tariff on imported capital inputs,

$PWMK_{i,t}$ is the international price of imported capital inputs and

$MK_{i,t}$ is total imported capital inputs.

In the revenues or expenditures of the government, taxes or subsidies to exports are included, which depend on the tax rate, the international price and the exchange rate such that

$$TAXC_t = \sum_i TE_{i,t} * PWE_{i,t} * E_{i,t} * ER_t \quad . \tag{17}$$

Direct revenues are derived by multiplying the corresponding tax rate to total household income,

$$TAXD_t = \sum_k TY_{k,t} * YH_{k,t} \quad . \tag{18}$$

Government revenue also includes income from foreign donations which in the case of Nicaragua has gained increased predominance in the nineties. This source of revenue has allowed a greater amount of public investment,

$$TAXE_t = ER_t * GTRANSF_t \quad . \tag{19}$$

Even though most government businesses have been privatized, the government still owns a number of public services, so fiscal revenues also include profits derived from state enterprises,

$$TAXF_t = \sum_i RK_{i,t} * KF_{i,t} * GPROSH_i \tag{20}$$

where $GPROSH_i$ is the share of the government participation in each sector.

Savings

Domestic savings come from subtracting from disposable income, debt payments adjusted by the marginal propensity to save,

$$SC_{k,t} = S_k * \left(Y_{k,t} - SHX_t * RWI_t * DEBT_t * ER_t\right) \quad (21)$$

where

SC is total savings from class k at time t

S is propensity to save by class k

SHX share of debt burden of class k

Therefore, the model incorporates the impact of debt payments on macroeconomic aggregates, particularly savings and investment.

Total savings $STOT_t$ comes from domestic savings of households or social classes $SC_{k,t}$, plus government savings $SAVG_t$, and foreign savings in the form of bond B_t . In local currency this amount is $ER_t * B_t$,

$$STOT_t = \sum_k SC_{k,t} + SAVG_t + ER_t * B_t \quad . \quad (22)$$

The equation that applies to foreign savings is presented in another section. The total savings variable serves as a closure variable for the model.

Investment

The national demand for intermediate goods $DI_{i,t}$ is a function of national production XQ and of the technical coefficients $A_{i,j}$ of the input-output table of the

Social Accounting Matrix such that

$$DI_{i,t} = \sum_{j} A_{i,j} * XQ_{j,t} \qquad (23)$$

The supply of intermediate goods *JK* is equal to the investment in each sector *IK* adjusted by transaction costs and tax policy TC. Note that adjustment costs $\theta_{i,t}$ vary across sectors and over time,

$$JK_{i,t} = \left[\left(1 - TC_{i,t}\right) + \theta_{i,t}\right] * IK_{i,t} \qquad (24)$$

Total investment by destination sector is equal to the aggregation of investment in each of the sectors,

$$JKTOT_{t} = \sum_{i} JK_{i,t} \quad . \qquad (25)$$

Equilibrium conditions of the model

To solve the system of equations of the model, a number of macroeconomic constraints need to be met which reflect the macroeconomic equilibrium of the economy. Supply must equal demand,

$$X_{i,t} = D_{i,t} + \sum_{k} C_{i,k,t} + GK_{i,t} + ID_{i,t} \quad . \qquad (26)$$

Aggregate demand is the addition of the demand for national goods, imports, government expenditures, and intermediate demand.

Similarly, constraints that establish the equilibrium in the factor markets also

need to be met.

Salaries

In this model, the typical rigidities that characterize the Nicaraguan labor market are incorporated in the form of structural constraints. Rather than following a traditional supply and demand representation, the legal and institutional environment surrounding this market in Nicaragua calls for a more institutional approach. Thus, salaries in each sector are determined by the average national salary WA_t and the deviation of each sector's salary from this average $WDIST_i$. This deviation is a representation of rigidities in the Nicaraguan labor market,

$$WL_{i,t} = WA_t * WDIST_i \tag{27}$$

Capital profits

Capital profits come from subtracting from gross production the labor cost

$$RK_{i,t} * KF_{i,t} = PV_{i,t} * XQ_{i,t} - WL_{i,t} * L_{i,t} \tag{28}$$

Capital accumulation for each period is distinct and takes into account the depreciation from the previous period plus the effective investment by sector of destiny $IK_{i,t.}$

$$KF_{i,t+1} = KF_{i,t} * \left(1 - KDGR_i\right) + IK_{i,t} \quad . \tag{29}$$

Employment

Following the structural approach, the model considers the existence of unemployment in the economy, so the following constraint applies,

$$DES_t = LS_t - \sum_i L_{i,t} \ . \tag{30}$$

Therefore, unemployment is the result of the difference between the total supply of labor LS_t and effective employment in each of the sectors in the model.

Closure equations of the model

Finally, the model requires a set of closure equations to reflect the macroeconomic equilibrium of the economy. In this case, foreign savings, defined as B, cover the difference between savings and investment.

Foreign savings are therefore given by the difference between imports of intermediate consumer and capital goods and exports, debt service, minus foreign remittances received by each social class. Other foreign transfers to the government must be subtracted,

$$\begin{aligned} B_t = & \sum_i PWMN_{i,t} * MN_{i,t} + \sum_i PWMC_{i,t} * MC_{i,t} + \sum_i PWMK_{i,t} * MK_{i,t} \\ & - \sum_i PWE_{i,t} * E_{i,t} + RWI_t * DEBT_t - \sum_k REMIT_{k,t} - GRANSF_t \end{aligned} \tag{31}$$

Foreign savings at the same time have an impact on the stock of debt in accord with the following condition,

$$DEBT_{t+1} = DEBT_t + B_t \quad (32)$$

Model's Main Parameters

As with all general equilibrium models, the one used in this dissertation makes use of multiple parameters of different sort. This section describes what these parameters are and how important they are for the model's results. The parameters can be categorized in the following groups, which are then described in detail: Behavioral parameters, structural parameters, technological parameters, policy parameters, and exogenous prices. Some considerations on how relevant they are for the results are also included.

Behavioral parameters: these are parameters associated with the utilility function which in turn determines consumption patterns and consumption shares, especially between agriculture-related goods and products from the rest of the economy. Consumption patterns from the 1993 Living Standard Measurement Survey were used in the determination of these parameters. Other parameters that are included in this category are the propensities to save among social classes. Again, for the estimation of these parameters information on consumption was used.

Structural parameters: These parameters are related to economic relations characterizing the Nicaraguan economy. One of the most important in the model is the participation of the private sector in foreign debt's interest payments. Information from national accounts allowed a reasonable estimation of this

important parameter.

An important feature of the model is the inclusion of unemployment, reflecting the characteristics of the Nicaraguan economy. In fact, the idea was to replicate in the model the actual rate of open unemployment of approximately 14 per cent. This was incorporated by introducing a wage differential, in the form of a parameter, between the two sectors. This generates that the traditional market clearing and equalization of salaries in the economy does not hold, with the possibility of unemployment. The model was also solved eliminating this condition, and the results were somewhat different in the levels of consumption and output.

A limitation of the model is an absence of an investment-financial module which incorporates more specific dynamics regarding the formation of capital and investment in the model. Investment relations are only determined by structural relations among economic sectors (of origin and destiny of the investment). Only the inclusion of such module could determine how crucial they are for the determination of the results. The relations between sectors of origin and destiny were obtained from national accounts.

Technological parameters: It is with respect to technology that the model makes the larger number of assumptions in the form of parameters. Most of these parameters are embedded on the Social Accounting Matrix, such as the input-output matrix, which relates, in the form of parameters, the economic and technological relations among sectors. Other technological parameters, especially

those associated with production functions (elasticity of transformation and input share parameters), were assumed using international standards.

Policy parameters: These are the ones regarding the simulations and other policy variables, such as value added taxes on imports (intermediate, final and capital goods), income taxes, export subsidies, and the exchange rate. The parameters were obtained from actual fiscal information, and for the case of taxes are related more to effective rates rather than the rates established by law.

Exogenous prices: These mostly relate to international prices for imports and export prices, as well as international interest rates. As expected, changes on these parameters would generate inflation and changes in the balance of payments.

In general, the most crucial parameters in the determination of the results appear to be the structural parameters, as they play a fundamental role in the determination of the overall equilibrium. The selection of such parameters and relations had the intention of replicating the actual characteristics of the Nicaraguan economy at that moment, and the impact of policies on variables that are extremely relevant for the case of Nicaragua, such as unemployment and debt.

Computational difficulties and limitations of the model

As depicted on Annex B, the model is solved using GAMS (General Algebraic Modeling System). The model was first solved without simulations and for the base year it must generate the real life Social Accounting Matrix (Annex

A). It took some calibration to secure the stability of the results. Once the model was calibrated, policy simulations were introduced by changing the path over time of the desired variables. Given the extensive details of the policy variables, it is possible to change one or various policies at the same time. The specification of two sectors, agriculture and rest of the economy, allows for a differentiation of the policies by sectors. The flexibility of the model thus secures a simultaneous incorporation of policy experiments. After running the final set of policy mix, the model was tested for a variety of policy combinations and showed robustness. Only when the model included very large changes in the crawling peg rate, no optimal solution could be found.

In addition, the model depicted lacks a number of relationships that are worth mentioning, especially in relation to savings, investments and government spending. To have a better understanding of these limitations some definitions are worth remembering. Total savings from the private sector (SC) are the difference between income and debt payments to the rest of the world. This means that in the model the private sector pays a portion of the foreign debt. This portion is very small in comparison to the share paid by the Central Government. Private savings are in turn an important component of total national savings (STOT), which is the sum of savings from the private sector (SC) plus government savings (SAVG), which are exogenous and foreign savings (Bt). Foreign saving is truly the closing variable of the model in the sense that foreign resources must cover any

disequilibrium between savings and investments.

The other closing option for the model was the incorporation of the market clearing condition between savings and investment. However, this option is inconsistent with the Nicaraguan reality, as the two variables have shown to depict divergent path in different periods. The accumulation of foreign debt in the past is also an indication that the imbalances in the investment markets have been financed with increased borrowing from abroad.

The investment relations are modeled in a simple way, reflecting the investment relationships of the Social Accounting Matrix. On the one hand, there are investments from a particular sector, depicted by ID, and investment destined to a particular sector JK. The relationships among sectors are therefore incorporated in the input matrices parameters´. The model also incorporates the possibility of capital taxes and transaction costs of investments, which lead to the definition of IK which is the adjusted or effective investment, after adjusting for such variables.

The General Equilibrium Model used does not incorporate an explicit relation between government spending (GK) and the investment variables (either JK or IK), particularly from the private sector. The reason behind this is mainly empirical; as opposed to developed countries, where government spending creates a crowding out effect on private activity, the opposite appears to occur in Nicaragua in the nineties. There are, however, no consistent econometric estimates of this relationship due to a lack of long-term economic data. In order to avoid

ambiguities and bad parameterization, no relationship is incorporated. In any case, if there really is a crowding-in effect, the results of the simulations underestimate the actual effects on the real side of the economy, and thus the overall effect of changing government expenditures will be higher, without causing a fundamental change on the qualitative results.

There are also difficulties in incorporating a relationship between GK and investments at a sectoral level. That is, an explicit relationship of government spending in each sector (agriculture and rest) to investment in each of these sectors must also be incorporated. Again, with the lack of actual data, these relationships would be nothing more than educated guesses.

This lack of connection between the inflow of foreign resources and the real side of the economy is probably the most serious limitation of the model. As shown, the inflow of foreign resources allows an improvement in the balance of payments, but has no direct effect, neither on the supply nor on the demand for investment. This is a clear drawback of the model and must be the subject of future research. Fortunately, general equilibrium models with financial modules exist and would not be difficult to incorporate for the Nicaragua economy.

Investment modeling is generally difficult in a country such as Nicaragua. An intertemporal approach with perfect foresight for the modeling of consumption and savings and the estimation of investment parameters for the modeling of investment behavior faces relevant data availability constraints. A structuralist

approach in the tradition of Devarajan, Lewis and Robinson (1994) could have been extended to include a financial sector but relying in ad hoc characteristics for investment modeling anyway. This approach nevertheless, would not have added much to the questions being explored.

This model explores the impact on income distribution of changes in taxes, tariffs, the exchange rate and government spending. The introduction of investment behavior would have likely reinforced the same trends found in the current model, but would have added additional complexity. Instead, investment is modeled taking into account existent input output relationships for each sector in the base year combined with adjustment costs which reflects the depreciation of the capital stock.

Policy Simulations in a Dynamic General Equilibrium Model

The policy analysis consists in simulating and comparing the tradeoffs of an *orthodox adjustment program*, with a *pro-agricultural policy based strategy* over a time span of seven years (Table 5.1). The traditional *orthodox adjustment program* assumes that in order to improve the macroeconomic balance of the Nicaraguan economy in the short to medium term, government expenditures need to contract and the exchange rate needs to be devaluated in order to favor the performance of the export sector and the reduction of imports. In this simulation an overall five percent reduction with respect to the government spending level of the previous year for five years is assumed. Additionally, a six percent devaluation of the exchange

rate is assumed the first year of the program.

All tariffs for consumer, intermediate and capital goods are assumed to drop five percentage points with respect to the level of the previous year through the seven year projection. The tariff reduction is supposed to help the competitiveness of the economy by reducing the costs of intermediate and capital goods imports in support of domestic production. Government revenues from consumer taxes are supposed to increase twenty percent the first year with respect to the previous year, fifteen percent the second year and ten percent for the third year of the program. The policy decisions described above simulate a traditional IMF policy mix aimed at reducing the fiscal deficit and improving the current account balance.

The pro-agricultural program policy package aims at a more detailed policy mix which differentiates policies by sectors. The overall objective of this program is to provide temporal effective protection to agricultural production. This protection aims to improve the agricultural sector terms of trade and thus spur economic recovery without abandoning the commitment to adjust the economy. In turn, better incomes reduce poverty levels. Tariff rates are increased twenty five percent on agricultural consumer goods in the first year of the simulation. Then this tariff gradually decreases five percentage points with respect to the level of the previous year for the next four years thereafter holding constant. The pro-agricultural program protects consumer agricultural goods to improve the specific profitability of the sector as compared to the orthodox program, which decreases

protection across the board.

In order to reduce costs of production, tariffs for imported agricultural intermediate and capital goods decline five percentage points each year for seven years in this program. Consumer taxes for both agriculture and the other sectors of the economy increase fifteen percent the first year with respect to the previous year, ten percent the second year, and five percent for the third year of the program. Consumer taxes are higher in the orthodox program.

The devaluation of the exchange rate is fifteen percent the first year of the program compared to a six percent devaluation rate for the orthodox program. Government expenditures for the agricultural sector increased ten percent in the first year, five percent for the second and third year. Government expenditures aimed at other sectors of the economy remain constant in nominal terms.

A number of simulations were undertaken before reaching the set of policies that are presented in this chapter. One of the alternatives consisted in a mixed policy package which achieved better results in terms of adjustment but less impact in terms of favoring income across social classes. The objective of the simulations was to develop a set of policy options that would illustrate the contrasting alternatives and trade offs involved in trying to accomplish poverty reduction and macroeconomic adjustment.

The following table summarizes the specific content of the two policy alternatives simulated.

Table 5.1
Summary of policy alternatives

	Traditional orthodox	**Pro-agriculture**
Government Expenditures	All government expenditures decrease by five percent each year	Government expenditures for the agricultural sector increased ten percent in the first year, five percent for the second and third year. Government expenditures aimed at the rest of the economy remain constant
Devaluation	Six percent	Fifteen percent
Tariffs on imported good	Decrease of five points in consumer, intermediate and capital imported goods each year from previous year	Initial increase of twenty five percent in the tariff rate for agricultural consumer imported goods, the rate decreases five points each year. Decrease of five points in the tariff rate each year from previous year for intermediate and capital goods in agriculture
Consumption taxes	Twenty percent increase in government tax rates on consumption in the first year, followed by an increase of fifteen percent in the second and ten percent in the third	Fifteen percent increase in government tax rates on consumption in the first year, followed by an increase of ten percent in the second years and five percent in the third year

Results of the Policy Simulations

Policy choices such as the ones presented in this chapter involve tradeoffs. In this particular instance, the question for decision makers is about the alternative that will offer the largest gain in terms of economic growth and equitable income distribution, while maintaining current account sustainability and price stability.

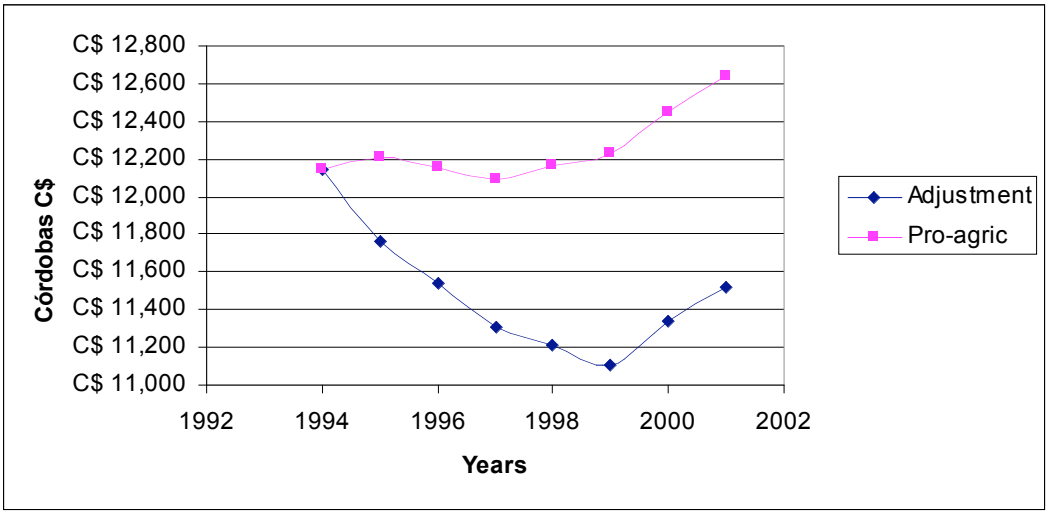
For open economies, deficit spending leads to excess demand which in turn puts pressure on the current account balance (Weaver, 1995). Unless deficits in the current account are financed by donations, loans or a reduction in foreign exchange reserves, inflationary pressures in domestic prices can result (Dornbusch, 1980). Inflation in turn affects investment and economic growth negatively in the medium to long term as it deteriorates the current account balance, primarily by way of its impact on the real exchange rate and smaller export levels (Bruno et al., 1992).

Taking into account a poverty reduction strategy such as in the case of Nicaragua, at the same time, would imply an additional concern such that the growth performance of the rural sector and the income distribution between social classes, specifically between rural and urban workers, favors rural workers where poverty is the worst. Similarly, the improvement in income in relative terms of rural capitalists would benefit the overall poverty level.

In terms of the results of the simulations, from a growth perspective, the orthodox adjustment package presents the higher costs, as the average income growth under the orthodox adjustment program is negative for the period while

growth under the pro-agricultural based strategy simulation is positive. The simulations indicate that net private income growth between 1994 and 2001 is a negative 4.1 percent under the orthodox adjustment program and a positive 5.1 percent under the pro-agricultural based strategy program (Figure 5.1).

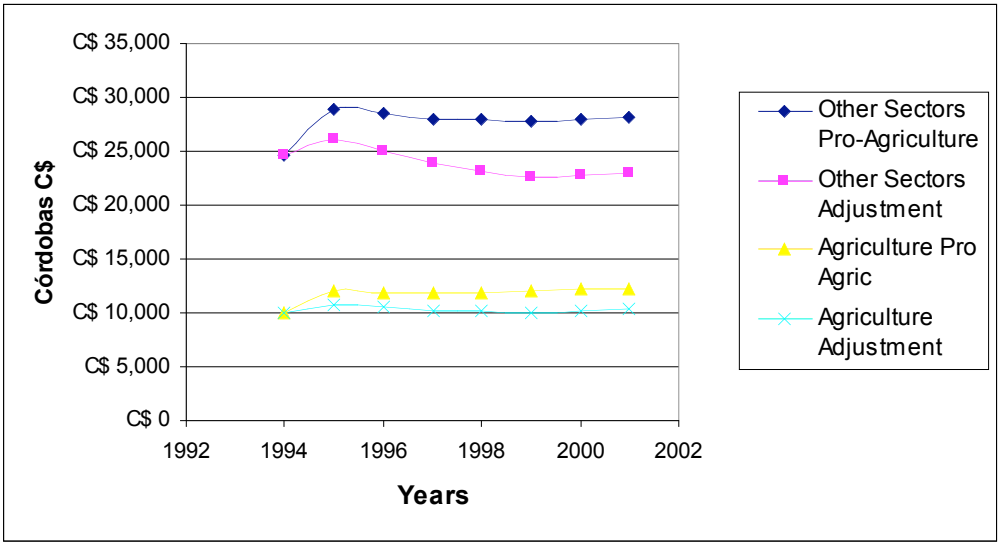
Figure 5.1: Private Income (1994-2001)



The performance of private income is explained by the behavior of sectoral Gross Domestic Product (GDP) under the different alternative policy packages. The sector net performance of GDP in the case of the orthodox adjustment program causes agriculture to expand only 4.5 percent and other sectors of the economy to contract 6.8 percent from 1994 to 2001. Under the pro-agricultural policy simulation agriculture expands 23.1 percent and the other sectors of the economy

experience 14.3 percent net growth (Figure 5.2).

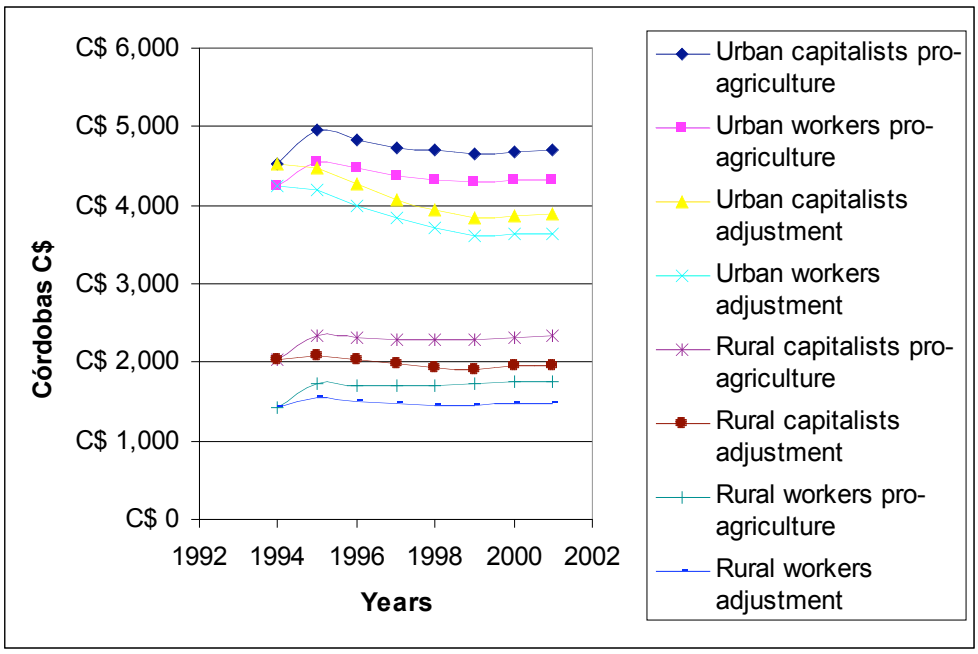
Figure 5.2: Sectoral GDP Growth (1994-2001)



In terms of sectoral income distribution, for the most part income deteriorates for capitalists and workers under the adjustment simulation package. Urban workers suffer a 15.1 percent net contraction during the period while the net contraction of urban capitalists is 14.7 percent. In the rural sector, rural capitalists experience a 3.9 percent net income contraction while rural workers experience a small net income growth of 4.2 percent. Under the pro-agriculture simulation strategy program however, urban capitalists experience an expansion of 4.2 percent while urban workers suffer a much smaller contraction of only 4.3 percent in relative terms than under the adjustment package. Rural capitalists and rural

workers, however, experience the largest gains under the pro-agricultural policy program of 14.7 and 22.8 percent net income growth respectively (Figure 5.3).

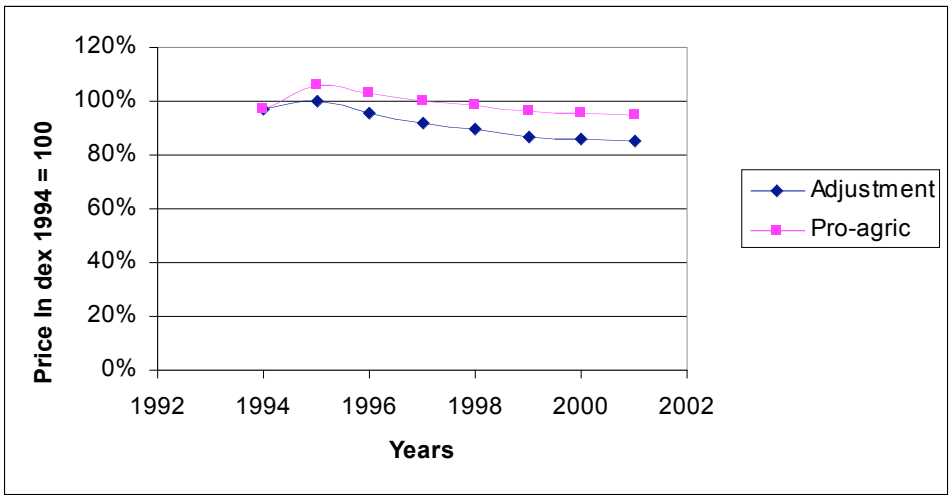
Figure 5.3: Income for Urban and Rural Capitalists and Workers (1994-2001)



In all examples, the adjustment package underperforms in terms of its impact on production and income in comparison with the pro-agriculture based strategy. From an income distribution perspective clearly the pro-agriculture strategy considerably improves, in relative terms, the lot of the rural sector and even benefits capitalists and workers in the urban sector. Thus this strategy would tend to have a larger impact in terms of poverty reduction given the labor intensive characteristics of production in the rural sector.

There are, however, a number of considerations that need to be taken into account in evaluating the feasibility and sustainability of alternative policy packages of this nature. For an open economy the impact of the real exchange rate, which in this model is sensitive to the evolution of domestic prices, is reflected in the current account balance. The orthodox adjustment package allows domestic price pressures to be the lowest (Figure 5.4), which in turn improve the real exchange rate and generate the lowest current account deficit of the two alternative policy programs.

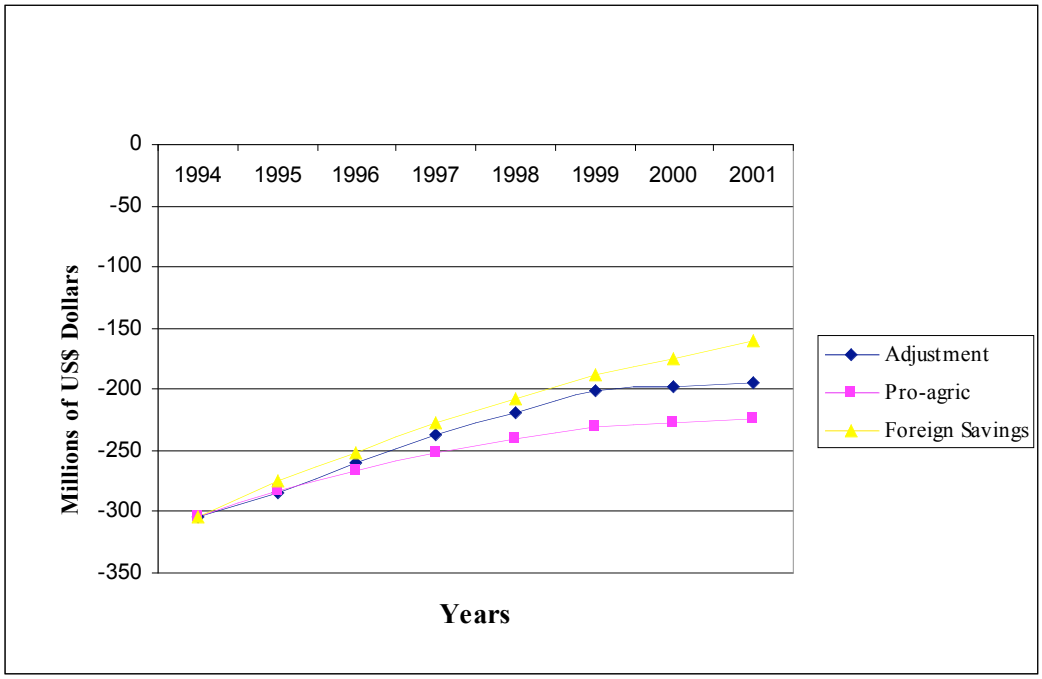
Figure 5.4: Price Index 1994-2001



Therefore, export growth in particular is favored with an orthodox adjustment package. At the same time, as an open and import dependent economy, the slower output growth also helps to stabilize the level of imports. Both dynamics help the current account as initially foreign savings are assumed to be the

same in all the simulations. Under the adjustment package the current account deficit is US$ 195 million, whereas under the pro-agriculture program it is US$ 225 (Figure 5.5).

Figure 5.5: Current Account Balance in millions of US$ (1994-2001)



There is, however, in the short to medium term a way to preserve the gains derived from a pro-agriculture based strategy program in terms of income distribution and poverty reduction considerations. If foreign aid is increased, in the form of budget or balance of payment support, government revenues and the current account improve. With additional aid, the current account deficit is only US$ 160 million, providing a way to smooth out the impact of adjustment and help make

possible the improved performance of the rural sector and overall poverty reduction.

Conclusions

The results of the simulations in this chapter show that for a country with the characteristics of Nicaragua, given the weight of poverty in the rural sector, a pro-agriculture policy package can produce better growth and income distribution in the rural sector while undergoing an adjustment program. However, while from an income distribution and growth perspective a pro-agriculture policy strategy is a better alternative, it is not consistent with price stability and current account sustainability in the long run. This policy deteriorates the real exchange rate more than a strict adjustment program. This reinforces the problems of competitiveness that the export sector would have with unsustainable costs in the long term, especially for an open economy dependent on foreign resources. This alternative, therefore, is not without economic costs.

In fact, the only way to afford such a strategy would be if adequate foreign resources or international reserves exist that could sustain the current account. Otherwise, deterioration will occur with medium and long term negative counterproductive consequences. As a result, a pro-agriculture package can only be a short to medium term alternative to smooth out the negative impacts of adjustment for the poor. Donor countries have to choose between giving aid in the form of development projects to developing countries or give balance of payment

support. What this dissertation points out is that it may be more effective to support broad macroeconomic sector growth policies for the sectors in which poverty is concentrated.

This may be considered a controversial proposition as it raises questions in terms of efficiency and the best way to allocate capital (Schydlowsky, 1995). A neutral incentive scheme is supposed to allocate capital more efficiently. Yet at the same time structural adjustment programs in developing countries during the eighties and nineties have been considered failures in terms of poverty reduction (Weaver, 1995). In the context of the Highly Indebted Poor Countries Initiative the issue of poverty reduction is dealt with by protecting poverty related expenditures. However, this relates to government spending, which is very limited in absolute terms and at times also ineffective (Vos, 1994). The World Bank (1990b) has argued that the labor intensity of growth makes it an effective tool for poverty reduction, since labor is the most important endowment that the poor have. Datt and Ravallion (1998) also have shown that sector composition is important for poverty reduction as the growth rate in agricultural output per hectare contributes to trends in poverty reduction. The prescriptive policies implemented since then, however, have not been consistent with these findings. What this dissertation argues is that it would take an active set of macroeconomic sector policies to improve the impact on poverty and that balance of payment support can be superior to development targeted projects in the short to medium term.

In the case of Nicaragua, an adjustment program is a prerequisite in order to obtain foreign resources. Given the country's high dependence on foreign aid, the cost of not adjusting is a luxury that cannot be afforded since it represents high social and economic costs that any government would have strong incentives to avoid. From a macroeconomic perspective, on the one hand, these simulations in fact prove the benefits that adjustment can bring to the economy in the long term. However, given Nicaragua's poverty problem, it is an option for policy makers, and donors and multilateral organizations should take into consideration this more gradual approach to adjustment by allowing policies that favor the development of the agricultural rural sector. In this way, a greater impact could be gained in terms of income growth and equitable distribution and poverty reduction in the short to medium term.

While decision makers do not have a control of the levels and the nature of foreign aid, an argument can be made that in the negotiation of an adjustment program, an approximation for the levels of aid and the nature of the resources available are usually estimated for at least three years in advance. The negotiation of these resources could be arranged with a specific policy framework in mind, which explicitly addresses policy alternatives that smooth out the impact on the poor of traditional adjustment programs.

While the applicability of a stylized model to the reality of the Nicaraguan economy, such as the one developed in this dissertation has its limits and

shortcomings, it serves the purpose of raising the issue that there is a link between macroeconomics and poverty, and that economies should be analyzed on a case by case basis. Standard policies might result inappropriate, particularly if foreign aid is available to smooth out the impact on the poor, if no account of the specificity of poverty is taken into consideration at the macroeconomic level.

For future research along this line a larger more detailed model of the economy would be desirable. A development of the financial sector would contribute to a more profound analysis of investment behavior and therefore a stronger link between the financial and real sector could show the implications of increased flexible forms of foreign aid in the real sector of the economy. In this dissertation only theoretical implications are addressed but financial variables have been explored in other country cases. However, the benefits and trade offs of alternative policies of adjustment and pro agricultural development indicate that the findings so far encountered, offer a promising venue in terms of applied research on the topic of adjustment and poverty policies for countries with relatively similar characteristics to the ones Nicaragua has faced.

Chapter 6: Conclusions

This dissertation describes the evolution of macroeconomic policy and its impact on poverty during the eighties and nineties in Nicaragua. In this respect it contributes to an understanding of the relationship of these two variables through empirical analysis and explores potential policy options for poverty reduction from a macroeconomic point of view.

Abrupt and sudden changes in political regimes and macroeconomic policies in the eighties and nineties in Nicaragua resulted in major physical and human resource transfers from one sector of the economy to another. Theses processes led to substantial increases in poverty in both the rural and urban sectors which needed to be reversed. The rural sector however, experienced the highest poverty levels.

Chapters 3 and 4 looked at the evolution of household welfare and poverty applying sector decomposition analysis in the context of changes in the macroeconomic performance, strategies and policies between 1985 and 1993 in Nicaragua. The policies that were adopted in many instances aggravated the impact of these shocks on the poor. The analysis shows in general how sensitive poverty increases can be to macroeconomic policies and shocks. Increases in inflation as a result of deficit spending led to investment and growth contraction and consequently affected poverty levels. In addition, in order to restore macroeconomic balance, the adjustment programs implemented relied in spending reductions and changes in relative prices with important consequences in increased poverty

levels, especially for the rural sector.

In this context, this dissertation argues that prescriptive policy has to be concerned not only with economic growth in the process of restoring macroeconomic balance, but the quality and sectoral nature of that growth. In order to have a significant impact in poverty reduction, growth needs to be labor intensive, given that labor is the most important endowment that the poor have. As adjustment programs can have a negative impact on the poor in the short term, it is argued that one way to offset this negative impact for the case of Nicaragua is by favoring a more dynamic growth of the rural sector. This follows because the country´s tradable good sector is primarily rural based and agricultural production is labor intensive.

Chapter 5 simulates a pro-agriculture policy strategy to favor the reduction of rural poverty compared to an orthodox adjustment program. The simulations results indicated that a pro-agriculture strategy performs better in the short to medium run in terms of growth and income distribution. However, this policy option is not without cost in terms of price stability and macroeconomic balance. The only way to afford such a strategy would be if adequate foreign savings or international reserves exist to sustain the current account. In this context, this dissertation points out that it may be more effective to support broad macroeconomic sector growth policies through balance of payment support, than giving aid in the form of development projects.

In the end, the most important element in the short to medium term that can change the lot of the poor is if employment opportunities are created and there is an increased participation of the poor in income generating activities. The protection of poverty related expenditures in adjustment packages under the "Highly Indebted Poor Countries Initiative" thus is insufficient to deal with poverty problems, particularly if most foreign aid that developing countries typically receive and that constitute a large part of their budget, is oriented to isolated development projects at a micro level. A more gradual approach towards adjustment would have to be considered as desirable for this type of option to be acceptable to policy makers and multilateral financial organizations that typically finance and guide the implementation of adjustment programs in developing economies.

In this respect, the alternative sets of policies that may be required to deal with poverty reduction at a macro sectoral level have to be country specific as they need to be based on the particular characteristics and situations of each economy. The methodologies and analysis presented in this dissertation serve the purpose of illustrating the interaction between empirical analysis and policy design based on the case of Nicaragua. However, the emphasis on sectoral policies as opposed to a standard orthodox adjustment program is not an accepted proposition within multilateral organizations which are increasingly influential in the policy making process of developing countries. The contrasting arguments in favor of standard adjustment programs have in fact their own strength. Therefore, these are

important dilemmas that need to be resolved empirically and politically. Thus more research and discussion is needed to illuminate the issue of adjustment policy and poverty reduction and this dissertation hopes to contribute in this respect.

Appendix A: Social Accounting Matrix for Nicaragua 1995. Two Sectors - millions of Córdobas

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Agr. Sec.	**Rest of Ec.**	**Total**	**Agr. Sec.**	**Rest of Ec.**	**Total**	**Urban Wr**	**Rural Wr.**	**Urban Capit.**	**Rural Capit.**	**Total Classes**	**Food**	**Clothes**	**Household Exp.**	**Others**	**Needs**	**Government**	**Investmet**	**External S.**	**Total**
1 Agricultural Sector				7,624.80		7,624.80													2,914.30	**10,539.10**
2 Rest of the economy					24,323.70	24,323.70													1,886.40	**26,210.10**
3 Total				7,624.80	24,323.70	31,948.50													4,800.70	**36,749.20**
4 Sector Agrícola	578.10	602.90	1,181.00									6,867.10		13.00	76.90	6,957.00	101.80	12.30		**14,028.10**
5 Rest of the economy	4,613.30	15,228.70	19,842.00									576.80	892.70	1,181.50	790.40	3,441.40	1,371.60	1,329.50		**29,425.90**
6 Total	5,191.40	15,831.60	21,023.00									7,443.90	892.70	1,194.50	867.30	10,398.40	1,473.40	1,341.80		**23,612.00**
7 Classes	4,551.40	6,112.90	10,664.30														910.80		564.70	**12,139.80**
8 Urban worker	200.10	3,374.50	3,574.60														450.30		232.90	**4,257.80**
9 Rural worker	1,318.80		1,318.80																	**1,318.80**
10 Urban Capitalist	1,237.10	2,738.40	3,975.50														296.70		247.20	**4,519.40**
11 Rural Capitalist	1,795.40		1,795.40														163.80		84.60	**2,043.80**
12 Needs							3,730.00	1,137.60	3,416.50	2,114.30	10,398.40									**10,398.40**
13 Food							2,545.30	901.60	2,255.70	1,741.30	7,443.90									**7,443.90**
14 Clothes							383.40	74.00	303.70	131.60	892.70									**892.70**
15 Household Expenses							494.20	100.30	432.20	167.80	1,194.50									**1,194.50**
16 Others							307.10	61.70	424.90	73.60	867.30									**867.30**
17 Government	57.30	902.60	959.90	45.60	171.50	217.10	649.90	183.40	898.90	351.00	2,083.20						237.60	671.10	1,134.40	**5,303.30**
18 Tariffs	57.30	292.40	349.70	45.60	171.50	217.10											0.00	116.10		**682.90**
19 Indirect tax							601.60	183.40	551.00	341.00	1,677.00						237.60	555.00		**2,469.60**
20 Direct tax							48.30		347.90	10.00	406.20									**406.20**
21 Transfers		610.20	610.20																1,134.40	**1,744.60**
22 Saving							-122.10	-2.20	145.30	-421.50	-400.50						1,988.90		2,408.20	**3,996.60**
23 External Sector	739.00	3,363.00	4,102.00	581.70	1,489.30	2,071.00			58.70		58.70						692.60	1,983.70		**8,908.00**
24 Goods and Ser Import	739.00	3,363.00	4,102.00	581.70	1,489.30	2,071.00												1,983.70		**8,156.70**
25 Factor interest payments									58.70		58.70						692.60			**751.30**
26 Total	**10,539.10**	**26,210.10**	**36,749.20**	**8,252.10**	**25,984.50**	**34,236.60**	**4,257.80**	**1,318.80**	**4,519.40**	**2,043.80**	**12,139.80**	**7,443.90**	**892.70**	**1,194.50**	**867.30**	**10,398.40**	**5,303.30**	**3,996.60**	**8,908.00**	

Appendix B.1 Poverty Decomposition Analysis by Characteristics of Household, Nicaragua 1985

Characteristics	P^o	p^1	p^2	Share of Population	Contribution to National Poverty		
					p^0	p^1	p^2
Sex							
Male	0.4173	0.1550	0.0811	0.83	0.8093	0.7917	0.7785
Female	0.4806	0.1994	0.1129	0.17	0.1909	0.2086	0.2219
Total	0.4280	0.1625	0.0865				
Age							
15-60 years	0.3617	0.1528	0.0802	0.91	0.7690	0.8557	0.8433
> 60 Years	0.5850	0.2576	0.1487	0.09	0.1230	0.1427	0.1547
Total	0.4280	0.1625	0.0865				
Number of Household Members							
<=2 Members	0.5147	0.2077	0.1160	0.08	0.0962	0.1023	0.1073
3-6 Members	0.4061	0.1518	0.0800	0.54	0.5124	0.5044	0.4999
7 and more	0.4405	0.1680	0.0893	0.38	0.3911	0.3929	0.3924
Total	0.4280	0.1625	0.0865				
Productive Sector							
Agriculture	0.6260	0.2703	0.1502	0.36	0.5265	0.5988	0.6251
Industry	0.3385	0.1036	0.0491	0.21	0.1661	0.1339	0.1193
Services	0.3113	0.1038	0.0531	0.43	0.3128	0.2747	0.2637
Total	0.4280	0.1625	0.0865				
Education Level							
Less than elementary	0.5356	0.2113	0.1141	0.68	0.8510	0.8842	0.8970
Elementary	0.2991	0.0869	0.0392	0.11	0.0769	0.0588	0.0508
High School	0.1711	0.0495	0.0236	0.14	0.0560	0.0426	0.0382
High School+	0.0310	0.0085	0.0046	0.06	0.0044	0.0032	0.0032
Illiterate	0.3918	0.1445	0.0723	0.01	0.0092	0.0089	0.0084
Total	0.4280	0.1625	0.0865				
Area of residence							
Urban	0.2949	0.0949	0.0471	0.55	0.3790	0.3211	0.2996
Rural	0.5936	0.2467	0.1355	0.45	0.6241	0.6832	0.7049
Total	0.4280	0.1625	0.0865				
Region of Residence							
Segovias	0.5403	0.2140	0.1146	0.12	0.1515	0.1580	0.1590
West	0.6207	0.2623	0.1480	0.19	0.2755	0.3067	0.3251
Managua	0.3018	0.0937	0.0441	0.32	0.2256	0.1844	0.1632
South	0.5080	0.2068	0.1131	0.17	0.2018	0.2163	0.2223
Central	0.2871	0.0995	0.0517	0.07	0.0470	0.0429	0.0418
North	0.3627	0.1327	0.0683	0.08	0.0678	0.0653	0.0632
Atlantic	0.2694	0.0883	0.0456	0.05	0.0315	0.0272	0.0264
Total	0.4280	0.1625	0.0865				
Formal/ Informal Sector							
Formal Sector	0.4233	0.1456	0.0704	0.46	0.4550	0.4122	0.3744
Informal Sector	0.4320	0.1770	0.1004	0.54	0.5451	0.5882	0.6268
Total	0.4280	0.1625	0.0865				
Employment Status							
Self- Employed	0.4128	0.1526	0.0873	0.41	0.3954	0.3850	0.4138
Manager	0.1119	0.0345	0.0715	0.06	0.0157	0.0127	0.0121
Worker	0.4745	0.1733	0.0873	0.53	0.5876	0.5652	0.5349
Total	0.4280	0.1625	0.8650				
Employment Sector							
Modern Agriculture	0.6983	0.3069	0.1649	0.05	0.0816	0.0944	0.0953
Subsistence	0.5961	0.2595	0.1485	0.25	0.3482	0.3992	0.4292
Formal	0.3034	0.0832	0.0356	0.08	0.0567	0.0410	0.0329
Urban Informal	0.3297	0.1237	0.0683	0.33	0.2542	0.2512	0.2606
Public Sector	0.3819	0.1196	0.0542	0.29	0.2588	0.2134	0.1817
Total	0.4280	0.1625	0.0865				

Source: Calculations are based on the Nicaraguan Socio-Demograhic Survey (ESDENIC), 1985.

Appendix B.2 Poverty Decomposition Analysis by Characteristics of Head of Household, 1993

Characteristics	P^o	p^1	p^2	Share of Population	Contribution to National Poverty		
					p^0	p^1	p^2
Sex							
Male	0.6967	0.3667	0.2315	0.72	0.7341	0.7507	0.7583
Female	0.6484	0.3130	0.1894	0.28	0.2657	0.2492	0.2413
Total	0.6833	0.3517	0.2198				
Age							
15-60 years	0.6885	0.3567	0.2239	0.85	0.8565	0.8261	0.8659
> 60 Years	0.6548	0.3245	0.1971	0.15	0.1437	0.1384	0.1345
Total	0.6833	0.3517	0.2198				
Number of Household							
Members	0.4143	0.1715	0.0907	0.11	0.0667	0.0536	0.0454
<=2 Members	0.6440	0.3068	0.1817	0.57	0.5372	0.4972	0.4712
3-6 Members	0.8437	0.4917	0.3305	0.32	0.3951	0.4474	0.4812
7 and more	0.6833	0.3517	0.2198				
Total							
Productive Sector							
Agriculture	0.8839	0.5332	0.3603	0.41	0.5304	0.6099	0.6721
Industry	0.6213	0.2716	0.1509	0.15	0.1364	0.1158	0.1030
Services	0.5189	0.2156	0.1169	0.44	0.3341	0.2697	0.2340
Total	0.6833	0.3517	0.2198				
Education Level							
Less than elementary	0.7587	0.3942	0.2453	0.41	0.4552	0.4596	0.4576
Elementary	0.5917	0.2316	0.1168	0.11	0.0953	0.0724	0.0585
High School	0.4138	0.1510	0.0760	0.18	0.1090	0.0773	0.0622
High School+	0.1814	0.0475	0.0215	0.05	0.0133	0.0068	0.0049
Illiterate	0.8855	0.5357	0.3638	0.25	0.3240	0.3808	0.4138
Total	0.6833	0.3517	0.2198				
Area of residence							
Urban	0.5291	0.2188	0.1178	0.57	0.4414	0.3546	0.3055
Rural	0.8879	0.5281	0.3551	0.43	0.5588	0.6457	0.6947
Total	0.6833	0.3517	0.2198				
Region of Residence							
Segovias	0.8278	0.5003	0.3434	0.13	0.1575	0.1849	0.2031
West	0.6536	0.3132	0.1918	0.13	0.1244	0.1158	0.1134
Managua	0.4877	0.1922	0.0992	0.24	0.1713	0.1316	0.1083
South	0.5888	0.2772	0.1610	0.11	0.0948	0.0867	0.0806
Central	0.7934	0.4371	0.2559	0.14	0.1626	0.1740	0.1757
North	0.8312	0.4815	0.3263	0.13	0.1581	0.1780	0.1929
Atlantic	0.7533	0.3852	0.2352	0.12	0.1323	0.1314	0.1284
Total	0.6833	0.3517	0.2198				
Formal/ Informal Sector							
Formal Sector	0.5247	0.2260	0.1269	0.22	0.1689	0.1414	0.1270
Informal Sector	0.7296	0.3910	0.2490	0.78	0.8329	0.8672	0.8836
Total	0.6833	0.3517	0.2198				
Employment Status							
Self- Employed	0.7227	0.3950	0.2529	0.52	0.5500	0.5840	0.5983
Manager	0.3548	0.1494	0.0806	0.01	0.0052	0.0042	0.0037
Worker	0.6484	0.3135	0.1903	0.47	0.4460	0.4190	0.4070
Total	0.6833	0.3517	0.2198				
Employment Sector							
Modern Agriculture	0.8122	0.4595	0.3058	0.07	0.0832	0.0915	0.0974
Subsistence	0.8776	0.5233	0.3514	0.41	0.5266	0.6101	0.6555
Formal	0.4953	0.1881	0.0979	0.11	0.0797	0.0588	0.0490
Urban Informal	0.5259	0.2142	0.1124	0.29	0.2232	0.1766	0.1483
Public Sector	0.4740	0.1870	0.0982	0.12	0.0832	0.0638	0.0538
Total	0.6833	0.3517	0.2198				

Source: Calculations based in the Living Standard Measurement survey 1993, World Bank, (1993)

Appendix B.3. Changes in the Level of Poverty by Head of Household Characteristics

Characteristics	P^0			p^1			p^2		
	Within Groups	Between Groups	Cross Product	Within Groups	Between Groups	Cross Product	Within Groups	Between Groups	Cross Product
Sex									
Male	0.2319	-0.0459	-0.0307	0.1757	-0.0171	-0.0233	0.1248	-0.0089	-0.0165
Female	0.0286	0.0529	0.0185	0.0193	0.0219	0.0125	0.0130	0.0124	0.0084
Total	0.2604	0.0070	-0.0123	0.1950	0.0049	-0.0108	0.1379	0.0035	-0.0081
			0.2551			0.1892			0.1332
Age									
15-60 years	0.2974	-0.0217	-0.0196	0.1856	-0.0092	-0.0122	0.1308	-0.0048	-0.0086
> 60 Years	0.0063	0.0351	0.0042	0.0060	0.0155	0.0040	0.0044	0.0089	0.0029
Total	0.3037	0.0134	-0.0154	0.1916	0.0063	-0.0082	0.1351	0.0041	-0.0057
			0.3017			0.1896			0.1335
Number of Household Members	-0.0080	0.0154	-0.0030	-0.0029	0.0062	-0.0011	-0.0020	0.0035	0.0105
<=2 Members	0.1285	0.0122	0.0071	0.0837	0.0046	0.0047	0.0549	0.0024	-0.0061
3-6 Members	0.1532	-0.0264	-0.2420	0.1230	-0.0101	-0.0194	0.0917	-0.0054	0.0006
7 and more	0.2737	0.0012	-0.0201	0.2038	0.0007	-0.0159	0.1445	0.0005	0.0050
Total			0.2548			0.1887			0.1346
Productive Sector									
Agriculture	0.0928	0.0313	0.0129	0.0946	0.0135	0.0131	0.0756	0.0075	0.0105
Industry	0.0594	-0.0203	-0.0170	0.0353	-0.0062	-0.0101	0.0214	-0.0030	-0.0061
Services	0.0893	0.0031	0.0021	0.0481	0.0010	0.0011	0.0274	0.0005	0.0006
Total	0.2415	0.0141	-0.0020	0.1780	0.0083	0.0083	0.1244	0.0051	0.0050
			0.2536			0.1905			0.1346
Education Level									
Less than elementary	0.1517	-0.1446	-0.0602	0.1244	-0.0571	-0.0494	0.0892	-0.3080	-0.0354
Elementary	0.0322	0.0000	0.0000	0.0159	0.0000	0.0000	0.0085	0.0000	0.0000
High School	0.0340	0.0068	0.0097	0.0142	0.0020	0.0041	0.0073	0.0009	0.0021
High School+	0.0090	-0.0003	-0.0015	0.0023	0.0000	-0.0004	0.0010	0.0000	-0.0002
Illiterate	0.0049	0.0940	0.1185	0.0039	0.0347	0.0939	0.0029	0.0174	0.0700
Total	0.2318	-0.0441	0.0665	0.1608		0.0482	0.1090	-0.0126	0.1329
			0.2542			0.1885			
Area of residence									
Urban	0.1288	0.0059	0.0047	0.0681	0.0019	0.0025	0.0389	0.0029	0.0014
Rural	0.1324	-0.0119	-0.0060	0.1266	-0.0049	-0.0056	0.0988	-0.0027	-0.0044
Total	0.2613	-0.0060	-0.0012	0.1948	-0.0030	-0.0032	0.1377	-0.0018	-0.0030
			0.2541			0.1896			0.1330
Region of Residence									
Segovias	0.0345	0.0054	0.0029	0.0344	0.0021	0.0029	0.0275	0.0012	0.0023
West	0.0063	-0.0372	-0.0020	0.0097	-0.0157	-0.0031	0.0083	-0.0089	-0.0026
Managua	0.0595	-0.0241	-0.0149	0.0315	-0.0075	-0.0079	0.0176	-0.0035	-0.0044
South	0.0137	-0.0305	-0.0050	0.0120	-0.0124	-0.0042	0.0081	-0.0068	-0.0029
Central	0.0354	0.0201	0.0354	0.0236	0.0070	0.0237	0.0143	0.0036	0.0143
North	0.0375	0.0181	0.0234	0.0279	0.0066	0.0174	0.0206	0.0034	0.0129
Atlantic	0.0242	0.0190	0.0339	0.0149	0.0062	0.0208	0.0104	0.0032	0.0145
Total	0.2111	-0.0294	0.0739	0.1539	-0.0137	0.0496	0.1069	-0.0078	0.0341
			0.2556			0.1897			0.1332
Formal/ Informal Sector									
Formal Sector	0.0466	-0.1016	-0.0243	0.0370	-0.0349	-0.0193	0.0260	-0.0169	-0.0136
Informal Sector	0,1607	0.1037	0.0714	0.1156	0.0425	0.0514	0.0802	0.0241	0.0357
Total	0.2073	0.0021	0.0471	0.1525	0.0075	0.0321	0.1062	0.0072	0.0221
			0.2565			0.1921			0.1335
Employment Status									
Self- Employed	0.1271	0.0454	0.0341	0.0994	0.0168	0.0267	0.0679	0.0096	0.0182
Manager	0.0146	-0.0056	-0.0121	0.0069	-0.0017	-0.0058	0.0038	-0.0009	-0.0032
Worker	0.0922	-0.0285	-0.0104	0.0743	-0.0104	-0.0084	0.0546	-0.0052	-0.0062
Total	0.2338	0.0113	0.0115	0.1806	0.0047	0.0125	0.1263	0.0035	0.0089
			0.2567			0.1978			0.1386
Employment Sector									
Modern Agriculture	0.0057	0.0140	0.0023	0.0076	0.0061	0.0031	0.0071	0.0033	0.0028
Subsistence	0.0704	0.0954	0.0450	0.0660	0.0415	0.0422	0.0507	0.0238	0.0325
Formal	0.0154	0.0091	0.0058	0.0084	0.0025	0.0031	0.0050	0.0011	0.0019
Urban Informal	0.0648	-0.0132	-0.0079	0.0299	-0.0050	-0.0036	0.0146	-0.0027	-0.0018
Public Sector	0.0267	-0.0649	-0.0157	0.0196	-0.0233	-0.0115	0.0128	-0.0092	-0.0075
Total	0.1829	0.0403	0.0296	0.1314	0.0249	0.0333	0.0901	0.0162	0.0279
			0.2528			0.1896			0.1342

Source: calculations based on the Nicaragua LSMS World Bank, 1993 and ESDENIC, 1985

Appendix C: GAMS Computer Program

```
* Model CGE for two sectors, four social classes and demand of
goods

* The next sentence avoids some lists output
$OFFSYMLIST OFFSYMXREF

* Title of the model in the lists
$TITLE 2 MODEL SECTORS

OPTION LIMROW=0 ;
*OPTIO/MIPLPRINT=OFF ;

* Definition of sets
 SETS
     I         SECTORS         /AGG, RT /

    URB(I)    URBAN ACTIVITIES   /RT /

    RUR(I)    RURAL ACTIVITIES  /AGG /

     K         SOCIAL CLASSES   / UW,RW,UKP,RKP/

     N         NEEDS      /AL, VE, GH, OT/

     YY        LEVEL OF INCOME   /NOP, POB, PEX/

     T         TOTAL PERIODS OF SIMULATION         /1994*2005/

     TT(T)     SIMULATION PERIODS PER RUN

* Alias are used to exchange subscripts in formulas

     ALIAS (I,J)
     ALIAS(K,KK)
     ALIAS(N,NN)
     ALIAS(YY,YYY)
      ;

*------- Definition of parameters and initial values of some
variables  -------*
* Parameter is a variable that remains the same during the model
execution

PARAMETER
         TIME(T)         Current Period
         A(I,J)          Output Input Coefficient
         AD(I)           Change parameter in the function COBB-
                          DOUGLAS
```

```
         ALPHA(I)        Parameter in adjustment investment
                          function
         BETA(I)         Parameter in adjustment investment
                          function
         AT(I)           Change parameter of the function CET
         BT(I)           Share parameter of the function CET
         RHOT(I)         Elasticity of transformation of the
                          function CET
         PWMC0(I)        Initial world price of MC
         PWMN0(I)        Initial world price of MN
         PWMK0(I)        Initial world price of MK
         PK0(I)          Capital price
         PWE0(I)         World price for exports of the Good I
         AC(I)           Change parameter of the function CES
         BC(I)           Share parameter of the function CES
         RHOC(I)         Elasticity of transformation of the
                          function CES
         AV(I)           Change parameter for added value
         BV(I)           Share parameter for added value
         RHOV(I)         Share elasticity of the added value
         AK(I)           Capital goods imports coefficient
         AN(I)           Imported input coefficient
**-------------------------------------------------------------
         Q(N,K)          Propensity to consume by class and goods
                          type
         QQ(I,K)         Propensity to consume by class and goods
                          type
         CB0(I)          Private consumption of the good I
         CBB0(I,K)       Private Consumption of the good I by Class
**-------------------------------------------------------------
         GPROSH(I)       Government participation in gains
         KDGR(I)         Depreciation rate
         THETA0(I)       Investment adjustment costs
         RWI0            International interest rate
         IMAT(I,J)       Matrix of investment transformation from
                          source to destination
         KSHARE(I)       Investment share by destination of total
                          investment
**-------------------------------------------------------------
         BIENEC(I,N)     CONVERTION MATRIX FROM NEEDS TO GOODS
         NECINC(N,YY)    CONVERTION MATRIZ FROM INCOME LEVEL TO
                          NEEDS
         WUR
         GUR
**-------------------------------------------------------------
*----**  Policy parameters

*        TM0(I)          Import tariffs
         TXC0(I)         CONSUMPTION Added value tax rate
         TXG0(I)         GOVERNMENT Added value tax rate
         TXI0(I)                   INVESTMENT Added value tax rate
```

```
         TXMK0(I)        Added value tax to imported capital goods
         TXP0            Weighted average values added tax
         TS0(I)          Production subsidy tax
**-------------------------------------------------------------------
         TY0(K)          Direct income tax by class
**-------------------------------------------------------------------
         TE0(I)          Export subsidy tax
         TC0(I)          Investment subsidy tax
         WL0(I)          Nominal average salary of the Sector I
         WDIST(I)        Proportion from sectorial salary to
                         national average salary
         WA0             National average salary
         KF0(I)          Capital stock by sectors
         GK0(I)          Government real spending on the good I

         SHAREDX0        Private participation of interest payments
**-------------------------------------------------------------------
         NECPOB0(N,YY)
**-------------------------------------------------------------------
*----**  DUMMIES

* These variables are used to initialize the endogenous variables
values
* or to make calculations of the model coefficients

         L0(I)           Employment by sector
         LS0             Labor force of economic active population
         XQ0(I)          Product by sector
         PQ0(I)          Product price by sector
         P0(I)           Domestic price of the compound good
         X0(I)           Compound good for the sector I
         DI0(I)          Intermediate demand
         Z0(I)           Total revenues by sector I
         MN0(I)          Intermediate imported  inputs goods level
         MC0(I)          Imported consumer goods level
         MK0(I)          Imported capital goods level
         PMC0(I)         Initial price of MC
         PMK0(I)         Initial price of MK
         PMN0(I)         Initial price of MN
         E0(I)           Export volume
         ID0(I)          National Investment by source sector
         JK0(I)          Investment by destination sector
         IK0(I)          Effective investment by destination sector
         IDT0(I)         Total investment by source sector
         PE0(I)          Domestic price of exports
         PD0(I)          National production domestic price
**-------------------------------------------------------------------
         PC0(I)          Purchasing price
         PN0(N)          Needs purchasing price
         PY0(YY)         Purchasing price by income level
**------------------------------  --------------------------------
```

```
--
         D0(I)           Production to national market
         PV0(I)          Unit added value by sector
         DK0(I)          Investment by destination sector
         WTOT0(I)        Total paid salaries of the economy
         RK0(I)          Capital return by sector
         TMN0(I)         Intermediate inputs import tariff
         TMK0(I)         Capital input tariff
         TMC0(I)         Consumer input tariff
         TAXCA0          PRIVATE consumption tax
         TAXGA0          GOVERNMENT consumption tax
         TAXIA0          INVESTMENT tax
         TAXB0           Import tax
         TAXC0           Export tax
         TAXD0           Income tax
         TAXE0           Transfers
         TAXF0           Profit tax
         TAXG0           Purchase tax on capital imports
         TAXGG0(I)
*-----**  CLASS DUMMIES
         C0(N,K)         Real consumption of the good I of the
                          class K
         SC0(K)          Total saving by class
         YH0(K)          Income by class
         S(K)            Propensity to save
         Y0(K)           Net income tax
         REMIT0(K)       Foreign income
         GTRS0(K)        Public transfers to families
         INTCLS0(K)      DEBT INTEREST PAYMENTS OF CLASSES
         INTCL0(K)       PARTICIPATION COEFFICIENT OF INTEREST
                          PAYMENTS BY CLASS
                             ;
 SCALAR
* The scalars are to check numeric values to non-vector variables

          DES0        Open unemployment rate                / .143 /
          LG0         Government employment                   / 0 /
          TAX0        Government total income             / 5303.3/
          SAVG0       Government saving                   / 1988.9/
          STOT0       Total saving                        / 3996.6/
          INV0        Total nominal investment            / 3996.6/
          B0          Foreing saving IN DOLLARS   / 319.8140770252/
          ER0         Nominal exchange rate                / 7.53 /
          G           Rate of labor force growth              /.03/
          IPC0        CONSUMER INDEX PRICE                  / 1 /
          GTRANSF0    Donations to the government from foreign
                       cooperation                / 150.6507304117/
          DBSHP       Private interest payments             / 58.7 /
          DBSHG       Public interest payments            / 692.6 /
          DEBT0       Foreign debt                         /10000 /
```

```
         JKTOT0      Total investment                     /3996.6/
**-------------------------------------------------------------------
         WAR         Total rural salary                   /1518.9/
         WAU         Total urban salary                    /200.1/
         GAR         Total rural profits                  /3032.5/
         GAU         Rural urban profits                  /1237.1/
**-------------------------------------------------------------------
                  ;

  WUR = WAU/WAR;
  GUR = GAU/GAR;
**-------------------------------------------------------------------
 TABLE MIP(I,J) Input output matrix

        AGG             RT

 AGG     578.1         602.9
 RT     4613.3        15228.7
                  ;

 TABLE ELAST(*,I) Elasticities for the functions CET and CES
          AGG         RT

  SIGV    .9           .9
  SIGC    .7591286     .7591286
  SIGT    .5195701     .5195701

               ;

 TABLE SAMVEC(*,I) Initial values of parameters

                AGG         RT
 TC0              0          0
 TS0              0          0
 ALPHA            0          0
 BETA           0.5        0.5
 RK0         3032.5     3348.6
 L0               1          1
 WL0              1          1
 XQ0         10539.1    26210.1
 PQ0              1          1
 P0               1          1
 PC0              1          1
 X0          8252.1    25984.5
 CB0         6957.0     3441.4
 PMC0             1          1
 PMN0             1          1
 PMK0             1          1
 E0          2914.3     1886.4
 PE0              1          1
 PD0              1          1
```

```
 ID0           12.3     1329.5
**-------------------------------------------------------------------
 IDT0          79.7     3916.9
**-------------------------------------------------------------------
 WTOT0       1518.9     3374.5
 GK0          101.8     1371.6
 PWE0             1          1
 TMNTOT        57.3      292.4
 TMCTOT        45.6      171.5
 TMKTOT         1.5      114.6
 TETOT

 TXCTOT       264.3     1412.7
 TXGTOT        37.4      200.2
 TXITOT        14.1      540.9

 KDGR          0.04       0.04
 MN0          739.0     3363.0
 MC0          581.7     1489.3
 MK0          51.8      1931.9
 GPROSH          0       610.2
 AK              1          1

   ;

 TABLE CLASSES(*,K) Information for social classes

                 UW      RW     UKP        RKP
 SC0          -122.1    -2.2    145.3    -421.5
 TYTOT          48.3       0     347.9      10.0
 REMIT0        232.9       0     247.2      84.6
 GTRS0         450.3       0     296.7      163.8
 INTCLS0           0       0      58.7        0
 INTCL0            0       0       1          0

      ;

 REMIT0(K)=CLASSES("REMIT0",K)/ER0;

 TABLE  C0(N,K)  Initial consumption by class and sector

          UW        RW        UKP     RKP
  AL  2545.3     901.6     2255.7  1741.3
  VE   383.4      74.0      303.7   131.6
  GH   494.2     100.3      432.2   167.8
  OT   307.1      61.7      424.9    73.6

             ;
```

```
 TABLE  BIENEC(I,N)  NEEDS COMPOSITION IN GOODS TERMS
           AL         VE          GH         OT
  AGG   6867.1          0        13.0       76.9
  RT     576.8      892.7      1181.5      790.4
         ;

* Normalization of transformation matrix from needs to goods

  BIENEC(I,N)=BIENEC(I,N)/SUM(J,BIENEC(J,N));

  CB0(I)=SUM(K,SUM(N,BIENEC(I,N)*C0(N,K)));
  CBB0(I,K)=SUM(N,BIENEC(I,N)*C0(N,K));


  DISPLAY CB0,CBB0;

 TABLE NECINC(N,YY) INCOME COMPOSITION IN TERMS OF NEEDS

           NOP     POB      PEX

  AL     4408.1   2173.6  862.2
  VE      663.6    187.0   42.1
  GH      869.1    243.9   81.5
  OT      792.8     67.2    7.3
  ;
 NECINC(N,YY)=NECINC(N,YY)/SUM(YYY,NECINC(N,YYY));

*-------- CAPITAL INFORMATION FROM THE FILE KNIC -----*

 TABLE CAPITAL(*,I) CAPITAL STOCK AND INVESTMENT BY DESTINATION

               AGG           RT

  KF0   22336.717   25743.100
  JK0    1804.4      2192.2

               ;

 TABLE JMAT(I,J) COMPOSITION MATRIX OF TOTAL CAPITAL (MILLIONS OF
CORDOBAS)

             AGG           RT

 AGG                     79.7
 RT       1804.4      2112.5


  ;

*------This is where the paremeters values are read
```

```
               GPROSH(I)  = SAMVEC("GPROSH",I);
               ALPHA(I)  = SAMVEC("ALPHA",I);
               BETA(I)   = SAMVEC("BETA",I);
               L0(I)   = SAMVEC("L0",I);
               WL0(I)   = SAMVEC("WL0",I);
               RK0(I)   = SAMVEC("RK0",I);
               XQ0(I)   = SAMVEC("XQ0",I);
               PQ0(I)   = SAMVEC("PQ0",I) ;
               P0(I)  = SAMVEC("P0",I) ;
               PC0(I)  = SAMVEC("PC0",I) ;
               X0(I)  = SAMVEC("X0",I) ;
               CB0(I)  = SAMVEC("CB0",I) ;
*              DI0(I)  = SAMVEC("DI0",I) ;
               PMC0(I)  = SAMVEC("PMC0",I) ;
               PMN0(I)  = SAMVEC("PMN0",I) ;
               PMK0(I)  = SAMVEC("PMK0",I) ;
               AK(I)  = SAMVEC("AK",I) ;
               E0(I)   = SAMVEC("E0",I) ;
               PE0(I)  = SAMVEC("PE0",I) ;
               PD0(I)  = SAMVEC("PD0",I) ;
               WTOT0(I)= SAMVEC("WTOT0",I) ;
               GK0(I)  = SAMVEC("GK0",I) ;
*              Z0(I)   = SAMVEC("Z0",I) ;
               MN0(I)  = SAMVEC("MN0",I) ;
               MC0(I)  = SAMVEC("MC0",I) ;
               MK0(I)  = SAMVEC("MK0",I) ;
               KDGR(I) = SAMVEC("KDGR",I);
               id0(I) = SAMVEC("id0",I);

**-------------------------------------------------------------------
-----------
               idt0(I) = SAMVEC("idt0",I);
**-------------------------------------------------------------------
               TC0(I)  = SAMVEC("TC0",I);
               SC0(K)  = CLASSES("SC0",K) ;
               KF0(I)  = CAPITAL("KF0",I) ;
*              REMIT0(K) = CLASSES("REMIT0",K);
               GTRS0(K)  = CLASSES("GTRS0", K);
               INTCLS0(K) = CLASSES("INTCLS0", K);
               INTCL0(K) = CLASSES("INTCL0", K);
**-------------------------------------------------------------------
*               PN0(N)    =  PRECIO("PN0",N);
*               PY0(YY)   = COMPRA("PY0",YY);
**-------------------------------------------------------------------

*---- CALCULATION OF SOME SECTORIAL PARAMETERS
* Calibration

         TIME(T) = ORD(T)-1 ;
         RHOC(I) = (1/ELAST("SIGC",I))-1 ;
         RHOV(I) =                (1/ELAST("SIGV",I))-1 ;
```

```
         RHOT(I) = (1/ELAST("SIGT",I))+1 ;

         THETA0(I)= (KDGR(I)-ALPHA(I))**2/(2*BETA(I)*KDGR(I));
         GPROSH(I)= SAMVEC("GPROSH",I)/SAMVEC("RK0",I);
         D0(I)  = XQ0(I) - E0(I) ;
*        WL0(I) = (WTOT0(I)/L0(I)) ;
         L0(I) = WTOT0(I)/WL0(I);
         WA0=SUM(I,L0(I)*WL0(I))/SUM(J,L0(J));
         WDIST(I)=WL0(I)/WA0;

         MN0(I) = SAMVEC("MN0",I) + SAMVEC("TMNTOT",I) ;
         MC0(I) = SAMVEC("MC0",I) + SAMVEC("TMCTOT",I) ;
         MK0(I) = SAMVEC("MK0",I) + SAMVEC("TMKTOT",I) ;

         TMN0(I) = (SAMVEC("TMNTOT",I)/(MN0(I)-
SAMVEC("TMNTOT",I)))$(MN0(I) NE 0) ;
         TMC0(I) = (SAMVEC("TMCTOT",I)/(MC0(I)-
SAMVEC("TMCTOT",I)))$(MC0(I) NE 0) ;
         TMK0(I) = (SAMVEC("TMKTOT",I)/(MK0(I)-
SAMVEC("TMKTOT",I)))$(MK0(I) NE 0) ;


         PWMC0(I) = ((PMC0(I)*MC0(I)-SAMVEC("TMCTOT",I))/
                    (ER0*MC0(I))) $(MC0(I) NE 0);
         PWMN0(I) = ((PMN0(I)*MN0(I)-SAMVEC("TMNTOT",I))/
                    (ER0*MN0(I))) $(MN0(I) NE 0);
         PWMK0(I) = (((PMK0(I)*MK0(I))-SAMVEC("TMKTOT",I))/
                    (ER0*MK0(I))) $(MK0(I) NE 0);
         A(I,J) =  MIP(I,J)/XQ0(J) ;

         TXC0(I)   = SAMVEC("TXCTOT",I)/CB0(I);
         TXG0(I)   = SAMVEC("TXGTOT",I)/ GK0(I);
**-------------------------------------------------------------------
         TXI0(I)   = SAMVEC("TXITOT",I)/ (IDT0(I)-
SAMVEC("TXITOT",I));
**-------------------------------------------------------------------
         PC0(I) =    P0(I)*(1+TXC0(I))  ;
**-------------------------------------------------------------------
         PK0(I) =
(1+TXI0(I))*(P0(I)*(ID0(I)/IDT0(I))+PMK0(I)*(MK0(I)/IDT0(I)));
**-------------------------------------------------------------------
         PN0(N) = SUM(I,PC0(I)*BIENEC(I,N));
         PY0(YY) = SUM(N,PN0(N)*NECINC(N,YY));
**-------------------------------------------------------------------
         DISPLAY PK0;
         C0(N,K) =   C0(N,K) ;
         ID0(I)  =   ID0(I) ;
         GK0(I)  =   GK0(I) ;
```

```
         IK0(I)  =   (CAPITAL("JK0",I)/pk0(i))/(1-
TC0(I)+THETA0(I));

         NECPOB0(N,YY)  = SUM(K,C0(N,K))*NECINC(N,YY);

         DISPLAY NECPOB0;

         TE0(I) = (SAMVEC("TETOT",I)/(PE0(I)*E0(I)*ER0))
$(PE0(I)*E0(I)*ER0 NE 0) ;

         PWE0(I)= PE0(I)*(1+TE0(I))/ER0;
         RK0(I) = SAMVEC("RK0",I)/KF0(I)  ;
         TS0(I)  = SAMVEC("TS0",I)/XQ0(I) ;
         TS0(I)  = (1/(1+TS0(I)))- 1  ;
         AN(I) = MN0(I)/XQ0(I) ;
         PV0(I) = PQ0(I)/(1+TS0(I)) - SUM(J, A(J,I)*P0(J))-
AN(I)*PMN0(I) ;

         BV(I)  = WA0*WDIST(I)/RK0(I)*(L0(I)/KF0(I))**(1+RHOV(I)) ;
         BV(I)  = BV(I)/(1+BV(I)) ;

         AV(I) = XQ0(I)/(BV(I)*L0(I)**(-RHOV(I))+
                  (1-BV(I))*KF0(I)**(-RHOV(I)))**(-1/RHOV(I)) ;


         BT(I) = 1/(1+PD0(I)/PE0(I)*(E0(I)/D0(I))**(RHOT(I) - 1)) ;

         AT(I) = (  (XQ0(I)/(BT(I)*E0(I)**RHOT(I)+
                   (1-BT(I))*D0(I)**RHOT(I))**(1/RHOT(I)))  )
                         $(RHOT(I) NE 0 AND E0(I) NE 0 AND BT(I) NE
0) ;

         BC(I) =(
1/(1+1/(PMC0(I)/PD0(I)*(MC0(I)/D0(I))**(1+RHOC(I))))) $(MC0(I) NE
0) ;

         AC(I) = (X0(I)/(BC(I)*MC0(I)**(-RHOC(I))+
                  (1-BC(I))*D0(I)**(-RHOC(I)))**(-1/RHOC(I)))
                  $((BC(I)) NE 0 ) ;

*--------------CHOICES TO JOB OFFERINGS -------------------------*

*----USE IF EMPLOYMENT IS ASSUMED IN THE MODEL: ------------------*

       LS0 = SUM(I,L0(I))*(1+DES0) ;

*----USE IF FULL EMPLOYMENT IS ASSUMED:--------------------------*

*        LS0 = SUM(I,L0(I));
```

```
* -------------------------------------------------------------------*

         DI0(I) = SUM(J, A(I,J)*XQ0(J)) ;

         SHAREDX0 = DBSHP/(DBSHP+DBSHG);


*----* CALCULATION OF PARAMETERS BY CLASS
        RWI0 = (DBSHP + DBSHG)/(DEBT0*ER0);
**-------------------------------------------------------------------
        YH0("UW")  = SUM(URB, WA0*WDIST(URB)*L0(URB)) +
WUR*SUM(RUR,WA0*WDIST(RUR)*L0(RUR))
                   + IPC0*GTRS0("UW")
                   + ER0*REMIT0("UW") ;

        YH0("RW")  = (1-WUR)*SUM(RUR,WA0*WDIST(RUR)*L0(RUR))
                       + IPC0*GTRS0("RW")
                       + ER0*REMIT0("RW") ;

        YH0("UKP") = SUM(URB,(1-GPROSH(URB))*RK0(URB)*KF0(URB)) +
GUR*SUM(RUR,(1-GPROSH(RUR))*RK0(RUR)*KF0(RUR))
                     + IPC0*GTRS0("UKP")
                       + ER0*REMIT0("UKP") ;

        YH0("RKP") = (1-GUR)*SUM(RUR,(1-
GPROSH(RUR))*RK0(RUR)*KF0(RUR))
                    + IPC0*GTRS0("RKP")
                    + ER0*REMIT0("RKP") ;

       DISPLAY YH0;
**-------------------------------------------------------------------
        TY0(K) = CLASSES("TYTOT",K)/YH0(K)  ;
        Y0(K)  = (1-TY0(K))*YH0(K);

        Q(N,K) = PN0(N)*C0(N,K)/(Y0(K)-INTCLS0(K)) ;
        QQ(I,K) = PC0(I)*CBB0(I,K)/(Y0(K)-INTCLS0(K)) ;
        S(K)   = SC0(K)/(Y0(K)-INTCLS0(K));


* Display in screen some values to check

 DISPLAY BV,AV,BT,AT,BC,AC;

DISPLAY TXC0, TXG0, TXI0,BC, RHOC;

*----*CALCULATION OF PARAMETERS FOR INVESTMENT AND CAPITAL

         JK0(I)= CAPITAL("JK0",I)/PK0(I);
         JKTOT0 = SUM(I, JK0(I)) ;
         JMAT(I,J) = JMAT(I,J)/PK0(I) ;
         IMAT(I,J) =               JMAT(I,J)/JK0(J) ;
```

```
         KSHARE(I)  = PK0(I)*JK0(I)/INV0;
         IDT0(I) = SUM(J, IMAT(I,J)*JK0(J));

         AK(I)   = (MK0(I)/IDT0(I)) ;
         PARAMETER
         AK1(I);
         AK1(I)=ID0(I)/IDT0(I) ;

 DISPLAY
jktot0,PD0,PMC0,P0,XQ0,X0,D0,MC0,MK0,IDT0,ID0,AK,JMAT,KSHARE;

 TAXCA0 = SUM(I,TXC0(I)*P0(I)*CB0(I));
 TAXGA0 = SUM(I,TXG0(I)*P0(I)*GK0(I));
**-------------------------------------------------------------------
 TAXIA0 = SUM(I,(TXI0(I)/(1+TXI0(I)))*(PK0(I)*IDT0(I)));
**-------------------------------------------------------------------
 TAXB0 =     SUM(J,TMC0(J)*ER0*PWMC0(J)*MC0(J))
           + SUM(J,TMN0(J)*ER0*PWMN0(J)*MN0(J))
           + SUM(J,TMK0(J)*ER0*PWMK0(J)*MK0(J));
**-------------------------------------------------------------------
 TAXC0 = SUM(I,TE0(I)*ER0*PWE0(I)*E0(I));

 TAXD0 = SUM(K,TY0(K)*YH0(K));

 TAXE0 = ER0*GTRANSF0;

 TAXF0 = SUM(I,RK0(I)*KF0(I)*GPROSH(I));

 TAXGG0(I) =  PWMK0(I)*ER0*(1+TMK0(I))*MK0(I);


 DISPLAY TAXCA0, TAXGA0, TAXIA0,TAXB0,TAXC0, TAXD0, TAXE0,
TAXF0,TAX0,TAXGG0;

 DISPLAY X0, C0, GK0 ,ID0,DI0;

*-------------------- DEFINICION DE VARIABLES --------------------*

VARIABLE

  PQ(I,T)       PRODUCT PRICE
  PD(I,T)       DOMESTIC PRICE OF THE GOOD I
  PC(I,T)       SALES PRICE TO CONSUMERS OF THE GOOD I
  PN(N,T)       SALES PRICE TU CONSUMERS OF NEEDS
  PK(I,T)       CAPITAL GOOD PRICE
**-------------------------------------------------------------------
  PKK(I,T)       CAPITAL GOOD PRICE
**-------------------------------------------------------------------
  XQ(I,T)       NATIONAL PRODUCTION OF THE GOOD I
  E(I,T)        EXPORT VOLUME OF SECTOR I
  PM(I,T)       DOMESTIC PRICE OF  COMPETITIVE IMPORTS OF I
```

```
PMC(I,T)       DOMESTIC PRICE OF IMPORTS OF MC
PMK(I,T)       DOMESTIC PRICE OF IMPORTS OF MK
PMN(I,T)       DOMESTIC PRICE OF IMPORTS OF MN
PE(I,T)        DOMESTIC PRICE OF EXPORTS OF THE GOOD I
P(I,T)         PRICE OF THE COMPOUNDED GOOD OF IMPORTS AND
                NATIONAL PRODUCTION
IPC(T)         CONSUMER INDEX PRICE
X(I,T)         COMPOUNDED GOOD OF IMPORTS AND NATIONAL PRODUCTION
MC(I,T)        IMPORTATIONS OF MC
MN(I,T)        IMPORTATIONS OF MN
MK(I,T)        CAPITAL GOODS IMPORTATION BY SOURCE SECTOR
D(I,T)         NATIONAL PRODUCTION TO HOME MARKET
PV(I,T)        UNIT ADDED VALUE
ER(T)          NOMINAL EXCHANGE TYPE
WL(I,T)        AVERAGE SALARY OF SECTOR I
WA             NATIONAL AVERAGE SALARY
L(I,T)         WORKING FORCE DEMAND OF SECTOR I
DES(T)         TOTAL UNEMPLOYMENT
DI(I,T)        DEMAND FOR INTERMEDIATE NATIONAL GOODS
C(N,K,T)       DEMAND OF CLASS CLASE K FOR COMPOUNDED GOOD I
NECPOB(N,YY,T)  DEMAND OF THE NEED N BY POVERTY LEVEL
CB(I,T)        DEMAND FOR COMPOUNDED GOOD I
CBB(I,K,T)     DEMAND FOR COMPOUNDED GOOD I
Y(K,T)         AVAILABLE INCOME OF THE CLASS K
YH(K,T)        NOMINAL INCOME OF THE CLASS K
SC(K,T)        SAVINGS OF THE CLASS K
LG(T)          GOVERNMENT EMPLOYMENT
LS(T)          TOTAL LABOR FORCE
TAXAC(T)
TAXAG(T)
TAXAI(T)
TAXB(T)
TAXC(T)
TAXD(T)
TAXE(T)
TAXF(T)
TAXG(T)
TAX(T)         GOVERNMENT TOTAL INCOME
GK(I,T)        GOVERNMENT REAL SPENDING ON THE GOOD I
SAVG(T)        GOVERNMENT SAVING
RK(I,T)        CAPITAL RETURN
KF(I,T)        CAPITAL STOCK BY SECTORS
JK(I,T)        INVESTMENT BY DESTINATION SECTOR
IK(I,T)        EFFECTIVE INVESTMENT BY DESTINATION SECTOR
ID(I,T)        DOMESTIC INVESTMENT BY SOURCE SECTOR
IDT(I,T)       TOTAL INVESTMENT BY SOURCE SECTOR
THETA(I,T)     INVESTMENT ADJUSTMENT VARIABLE
TXC(I,T)       CONSUMPTION VALUE ADDED TAX
TXG(I,T)       GOVERNMENT VALUE ADDEDTAX
TXI(I,T)       INVESTMENT VALUED ADDED TAX
```

```
  TMC(I,T)       IMPORT TARIFFS FOR MC
  TMK(I,T)       IMPORT TARIFFS FOR MK
  TMN(I,T)       INVESTMENT TARIFFS FOR MN
  TY(K,T)        DIRECT TAXATION RATE BY CLASS
  TE(I,T)        TARIFF OR SUBSIDY TO EXPORTS
  TS(I,T)        TAX SUBSIDY TO THE NATIONAL PRODUCTION OF SECTOR I
  TC(I,T)        INVESTMENT TAX SUBSIDY
  INV(T)         TOTAL NOMINAL INVESTMENT
  JKTOT(T)       TOTAL REAL INVESTMENT
  STOT(T)        TOTAL NOMINAL SAVING
  B(T)           FOREIGN SAVING IN DOLLARS
  PWMN(I,T)      World price of MN
  PWMC(I,T)      World price of MC
  PWMK(I,T)      World price of MK
  PWE(I,T)       WORLD PRICE FOR EXPORTATIONS OF THE GOOD I
  OBJ            TARGET FUNCTION
  REMIT(K,T)     FOREIGN INCOME
  GTRANSF(T)     FOREIGN TRANSFERS TO GOVERMENT
  GTRS(K,T)      GOVERNMENT TRANSFERS TO FAMILIES
  SHAREDX(T)     PARTICIPATION OF PRIVATE INTEREST PAYMENTS
  DEBT(T)        FOREIGN DEBT
  RWI(T)         FOREIGN RATE
  INTCLAS(K,T)   DEBT INTEREST PAYMENTS BY CLASS          ;
Foreign

 EQUATIONS

* Equations identification

 EQ2(I,T)

 EQ3(I,T)

 EQ4(I,T)

*PNECESID(N,T)

*DEMBIEN(I,T)

 EQ5(I,T)

 EQ6(I,T)

 EQ7(I,T)

 EQ8(I,T)

 EQ9(I,T)

 EQMN(I,T)
```

```
 EQ10(I,T)

 EQ11(I,T)

 EQ12(I,T)

 EQ13(I,T)

 EQ14(I,T)

 EQ15(I,T)

 EQDINC(K,T)

 EQ16(I,K,T)

*EQ16A(N,YY,T)

 EQ17C(K,T)

 EQINCLA(K,T)

 EQPC(I,T)

 EQIPC(T)


 EQ18D1(T)
 EQ18D2(T)
 EQ18D3(T)
 EQ18D4(T)

 EQ19AC(T)
 EQ19AG(T)
 EQ19AI(T)

 EQ19B(T)

 EQ19C(T)

 EQ19D(T)

 EQ19E(T)

 EQ19F(T)

 EQ19(T)

 EQ20(T)

 JKEQ(I,T)
```

```
 EQTHETA(I,T)

 MKEQ(I,T)

 JKTOTDEF(I,T)

 JKSUM(T)

 IEQ(I,T)

 IDTEQ(I,T)

 PKDEFEQ(I,T)

 PKKDEF(I,T)

*EQ22(T)

*WALRAS(T)

 EQ23(I,T)

 DEBTEQ(T)

 STOTEQ(T)

 BOPEQ(T)

 EQ25(T)

* EQ25A(T)

 EQ26(I,T)

 EQ27(I,T)

 EQ28(T)

* EQ29(I,T)

 OBJECTIVE
  ;

 EQ2(I,T)$TT(T)..      PMN(I,T) =E= PWMN(I,T)*ER(T)*(1+TMN(I,T)) ;

 EQ3(I,T)$TT(T)..      PMC(I,T) =E= PWMC(I,T)*ER(T)*(1+TMC(I,T)) ;

 EQ4(I,T)$TT(T)..      PMK(I,T) =E= PWMK(I,T)*ER(T)*(1+TMK(I,T));
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```
 EQ5(I,T)$TT(T)..        PE(I,T) =E= PWE(I,T)*ER(T)/(1+TE(I,T)) ;

 EQ6(I,T)$TT(T)..        P(I,T)*X(I,T) =E= PD(I,T)*D(I,T) +
PMC(I,T)*MC(I,T) ;

 EQ7(I,T)$TT(T)..        PQ(I,T)*XQ(I,T) =E= PD(I,T)*D(I,T) +
PE(I,T)*E(I,T) ;

 EQ8(I,T)$TT(T)..        PV(I,T) =E= PQ(I,T)/(1+TS(I,T)) - SUM(J,
A(J,I)*P(J,T))- AN(I)*PMN(I,T);

*PNECESID(N,T)$TT(T)..  PN(N,T)   =E= SUM(I,PC(I,T)*BIENEC(I,N));

*DEMBIEN(I,T)$TT(T)..   CB(I,T) =E=
SUM(K,SUM(N,BIENEC(I,N)*C(N,K,T)));

 EQ9(I,T)$TT(T)..        XQ(I,T) =E= AV(I)*(BV(I)*L(I,T)**(-
RHOV(I))+(1-BV(I))
                        *KF(I,T)**(-RHOV(I)))**(-1/RHOV(I)) ;

 EQMN(I,T)$TT(T)..      MN(I,T) =E= AN(I)*XQ(I,T);

 EQ10(I,T)$TT(T)..      L(I,T) =E=
KF(I,T)*(RK(I,T)/WA(T)*WDIST(I)*BV(I)/(1-BV(I)))**(1/(1+RHOV(I))) ;

 EQ11(I,T)$TT(T)..      XQ(I,T) =E= AT(I)*(BT(I)*E(I,T)**RHOT(I) +
(1-BT(I))*D(I,T)**RHOT(I))**(1/RHOT(I)) ;

 EQ12(I,T)$TT(T)..      E(I,T)/D(I,T) =E= ( PE(I,T)/PD(I,T)*(1 -
BT(I))/BT(I) )**(1/(RHOT(I)-1) ) ;

 EQ13(I,T)$TT(T)..      X(I,T) =E= AC(I)*(BC(I)*MC(I,T)**(-RHOC(I))
+ (1-BC(I))*D(I,T)**(-RHOC(I)))**(-1/RHOC(I));

 EQ14(I,T)$TT(T)..      MC(I,T)/D(I,T) =E=
(PD(I,T)/PMC(I,T)*BC(I)/(1-BC(I)) )**(1/(1 + RHOC(I))) ;

 EQ15(I,T)$TT(T)..      DI(I,T) =E= SUM(J, A(I,J)*XQ(J,T)) ;

 EQDINC(K,T)$TT(T)..    Y(K,T)=E= (1-TY(K,T))*YH(K,T);

 EQ16(I,K,T)$TT(T)..    PC(I,T)*CBB(I,K,T) =E= QQ(I,K)*(Y(K,T)-
INTCLAS(K,T)) ;

*EQ16(N,K,T)$TT(T)..    PN(N,T)*C(N,K,T) =E= Q(N,K)*(Y(K,T)-
INTCLAS(K,T)) ;

*EQ16A(N,YY,T)$TT(T).. NECPOB(N,YY,T)  =E=
SUM(K,C(N,K,T))*NECINC(N,YY);

 EQPC(I,T)$TT(T)..      PC(I,T)      =E= P(I,T)*(1+TXC(I,T));
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```
 EQ17C(K,T)$TT(T)..    SC(K,T) =E= S(K)*(Y(K,T)-INTCLAS(K,T)) ;

*EQ17C(K,T)$TT(T)..   SC(K,T) =E= S(K)*(Y(K,T)-
SHAREDX(T)*RWI(T)*DEBT(T)*ER(T)) ;

 EQINCLA(K,T)$TT(T).. INTCLAS(K,T)
=E=INTCL0(K)*SHAREDX(T)*RWI(T)*DEBT(T)*ER(T);

* EQIPC(T)$TT(T)..     IPC(T) =E= (SUM(N,(SUM(K,
PN(N,T)*C(N,K,T)))))/(SUM(N,SUM(K,PN0(N)*C(N,K,T)))) ;

 EQIPC(T)$TT(T)..     IPC(T) =E= (SUM(I,(SUM(K,
PC(I,T)*CBB(I,K,T)))))/(SUM(I,SUM(K,PC0(I)*CBB(I,K,T)))) ;


 EQ18D1(T)$TT(T)..    YH("UW",T) =E=
SUM(URB,WA(T)*WDIST(URB)*L(URB,T)) +
WUR*SUM(RUR,WA(T)*WDIST(RUR)*L(RUR,T))
                                    + IPC(T)*GTRS("UW",T) +
ER(T)*REMIT("UW",T) ;
 EQ18D2(T)$TT(T)..    YH("RW",T) =E=(1-
WUR)*SUM(RUR,WA(T)*WDIST(RUR)*L(RUR,T))
                                    + IPC(T)*GTRS("RW",T) +
ER(T)*REMIT("RW",T) ;
 EQ18D3(T)$TT(T)..    YH("UKP",T) =E= SUM(URB,(1-
GPROSH(URB))*RK(URB,T)*KF(URB,T))+ GUR*SUM(RUR,(1-
GPROSH(RUR))*RK(RUR,T)*KF(RUR,T))
                                    + IPC(T)*GTRS("UKP",T) +
ER(T)*REMIT("UKP",T) ;
 EQ18D4(T)$TT(T)..    YH("RKP",T) =E=(1-GUR)*SUM(RUR,(1-
GPROSH(RUR))*RK(RUR,T)*KF(RUR,T)) + IPC(T)*GTRS("RKP",T) +
ER(T)*REMIT("RKP",T) ;

*EQ18D(K,T)$TT(T)..   YH(K,T) =E= SUM(I,(1-
GPROSH(I))*RK(I,T)*KF(I,T))+ SUM(I,WA(T)*WDIST(I)*L(I,T)) +
IPC(T)*GTRS(K,T) + ER(T)*REMIT(K,T) ;

*::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
*EQ19AC(T)$TT(T)..   TAXAC(T) =E=   SUM(I,TXC(I,T)*P(I,T)*CB(I,T));
 EQ19AC(T)$TT(T)..   TAXAC(T) =E=
SUM(I,TXC(I,T)*P(I,T)*(SUM(K,CBB(I,K,T))));
 EQ19AG(T)$TT(T)..   TAXAG(T) =E=   SUM(I,TXG(I,T)*P(I,T)*GK(I,T));
 EQ19AI(T)$TT(T)..   TAXAI(T) =E=
SUM(I,(TXI(I,T)/(1+TXI(I,T)))*PK(I,T)*IDT(I,T));
*::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
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 EQ19B(T)$TT(T)..    TAXB(T)=E=
SUM(J,TMC(J,T)*ER(T)*PWMC(J,T)*MC(J,T))
                                +
SUM(J,TMN(J,T)*ER(T)*PWMN(J,T)*MN(J,T))
                                +
SUM(J,TMK(J,T)*ER(T)*PWMK(J,T)*MK(J,T));

 EQ19C(T)$TT(T)..    TAXC(T) =E=
SUM(I,TE(I,T)*ER(T)*PWE(I,T)*E(I,T));

 EQ19D(T)$TT(T)..    TAXD(T) =E= SUM(K,TY(K,T)*YH(K,T));

 EQ19E(T)$TT(T)..    TAXE(T) =E= ER(T)*GTRANSF(T);

 EQ19F(T)$TT(T)..    TAXF(T) =E= SUM(I,RK(I,T)*KF(I,T)*GPROSH(I)) ;


 EQ19(T)$TT(T)..    TAX(T) =E=
TAXAC(T)+TAXAG(T)+TAXAI(T)+TAXB(T)+TAXC(T)+TAXD(T)+TAXE(T)+TAXF(T);


 EQ20(T)$TT(T)..         TAX(T) =E=
SUM(I,P(I,T)*(1+TXG(I,T))*GK(I,T))+ SUM(K,GTRS(K,T)*IPC(T))+
SAVG(T)
                        -
SUM(I,(TS(I,T)/(1+TS(I,T)))*PQ(I,T)*XQ(I,T))
                        + (1-SHAREDX(T))*RWI(T)*DEBT(T)*ER(T);

 JKEQ(I,T)$TT(T)..       JK(I,T)=E= (1-TC(I,T)+THETA(I,T))*IK(I,T);

 EQTHETA(I,T)$TT(T)..    THETA(I,T) =E= (IK(I,T)/KF(I,T) -
ALPHA(I))**2*KF(I,T) / (2*BETA(I)*IK(I,T));
**-------------------------------------------------------------------
 jKTOTDEF(I,T)$TT(T)..  PKK(I,T)*JK(I,T)=E=KSHARE(I)*INV(T);

 JKSUM(T)$TT(T)..         SUM(I,JK(I,T))=E=JKTOT(T);

 IEQ(I,T)$TT(T)..        IDT(I,T) =E= SUM(J, IMAT(I,J)*JK(J,T));

 IDTEQ(I,T)$TT(T)..      ID(I,T) =E=AK1(I)*IDT(I,T) ;

 MKEQ(I,T)$TT(T)..       MK(I,T)=E=AK(I)*IDT(I,T);

 PKDEFEQ(I,T)$TT(T)..    PK(I,T) =E= (1+TXI(I,T))*(P(I,T)*AK1(I)
                                     +PMK(I,T)*AK(I));

 PKKDEF(I,T)$TT(T)..    PKK(I,T) =E= SUM(J, PK(J,T)*IMAT(J,I)) ;

*EQ22(T)$TT(T)..         SUM(I, JK(I,T)*PKK(I,T))=E=INV(T);
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 STOTEQ(T)$TT(T)..      STOT(T) =E= SUM(K,SC(K,T)) + SAVG(T) +
ER(T)*B(T) ;

*WALRAS(T)$TT(T)..       INV(T) =E= STOT(T) ;

* EQ23(I,T)$TT(T)..      X(I,T) =E= DI(I,T) + CB(I,T) + GK(I,T) +
ID(I,T) ;
  EQ23(I,T)$TT(T)..      X(I,T) =E= DI(I,T) + SUM(K,CBB(I,K,T)) +
GK(I,T) + ID(I,T) ;

 BOPEQ(T)$TT(T)..     SUM(I, PWMN(I,T)*MN(I,T))
                     + SUM(I, PWMC(I,T)*MC(I,T))
                     + SUM(I, PWMK(I,T)*MK(I,T))
                     + RWI(T)*DEBT(T)
                     - SUM(I, PWE(I,T)*E(I,T))
                     - SUM(K,REMIT(K,T))
                     - GTRANSF(T) =E= B(T);


 DEBTEQ(T)$TT(T)..      DEBT(T+1) =E=  DEBT(T) + B(T)  ;

 EQ25(T)$TT(T)..       DES(T) =E= LS(T) - SUM(I,L(I,T)) ;

* EQ25A(T)$TT(T)..       SUM(I,L(I,T)) =E= LS(T) ;

 EQ26(I,T)$TT(T)..      RK(I,T)*KF(I,T) =E= PV(I,T)*XQ(I,T) -
WA(T)*WDIST(I)*L(I,T) ;

 EQ27(I,T)$TT(T)..      KF(I,T+1) =E= KF(I,T)*(1-KDGR(I)) +
IK(I,T);

 EQ28(T)$TT(T)..        LS(T) =E=  LS0*(1+G)**(TIME(T)-1);

* EQ29(I,T)$TT(T)..      WL(I,T) =E= WA(T)*WDIST(I);

* OBJETIVO..             OBJ =E= SUM(TT,SUM(N,SUM(K,C(N,K,TT))));
  OBJETIVO..             OBJ =E= SUM(TT,SUM(I,SUM(K,CBB(I,K,TT))));
*  OBJETIVO..             OBJ =E= 0;

*-------- INICIALIZATION OF VARIABLES
 PQ.L(I,T)=     PQ0(I)    *(1+G)**(TIME(T)-1);
 PD.L(I,T)=     PD0(I)    *(1+G)**(TIME(T)-1);
 PC.L(I,T)=     PC0(I)    *(1+G)**(TIME(T)-1);
 PN.L(N,T)=     PN0(N)    *(1+G)**(TIME(T)-1);
 PK.L(I,T)=     PK0(I)    *(1+G)**(TIME(T)-1);
 PKK.L(I,T)=    PK0(I)    *(1+G)**(TIME(T)-1);
 XQ.L(I,T)=     XQ0(I)    *(1+G)**(TIME(T)-1);
 E.L(I,T)=      E0(I)     *(1+G)**(TIME(T)-1);
 PMC.L(I,T)=    PMC0(I)  *(1+G)**(TIME(T)-1);
 PMK.L(I,T)=    PMK0(I)   *(1+G)**(TIME(T)-1);
 PMN.L(I,T)=    PMN0(I)             *(1+G)**(TIME(T)-1);
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PE.L(I,T)=      PE0(I)    *(1+G)**(TIME(T)-1);
P.L(I,T)=       P0(I)     *(1+G)**(TIME(T)-1);
IPC.L(T)=       IPC0      *(1+G)**(TIME(T)-1);
X.L(I,T)=       X0(I)     *(1+G)**(TIME(T)-1);
MC.L(I,T)=      MC0(I)    *(1+G)**(TIME(T)-1);
MN.L(I,T)=      MN0(I)    *(1+G)**(TIME(T)-1);
MK.L(I,T)=      MK0(I)    *(1+G)**(TIME(T)-1);
D.L(I,T)=       D0(I)     *(1+G)**(TIME(T)-1);
PV.L(I,T)=      PV0(I)    *(1+G)**(TIME(T)-1);
ER.L(T)=        ER0       *(1+G)**(TIME(T)-1);
WL.L(I,T)=      WL0(I)    *(1+G)**(TIME(T)-1);
WA.L(T)=        WA0;
L.L(I,T)=       L0(I)     *(1+G)**(TIME(T)-1);
DES.L(T)=       DES0      *(1+G)**(TIME(T)-1);
DI.L(I,T)=      DI0(I)    *(1+G)**(TIME(T)-1);
C.L(N,K,T)=     C0(N,K)   *(1+G)**(TIME(T)-1);
CBB.L(I,K,T)=  CBB0(I,K)   *(1+G)**(TIME(T)-1);
CB.L(I,T)=     CB0(I)   *(1+G)**(TIME(T)-1);
YH.L(K,T)=      YH0(K)    *(1+G)**(TIME(T)-1);
Y.L(K,T)=       Y0(K)    *(1+G)**(TIME(T)-1);
SC.L(K,T)=      SC0(K)    *(1+G)**(TIME(T)-1);
LG.L(T)=        LG0       *(1+G)**(TIME(T)-1);
LS.L(T)=        LS0       *(1+G)**(TIME(T)-1);
INTCLAS.L(K,T) =INTCLS0(K);
TAXAC.L(T)=      TAXCA0      *(1+G)**(TIME(T)-1);
TAXAG.L(T)=      TAXGA0      *(1+G)**(TIME(T)-1);
TAXAI.L(T)=      TAXIA0      *(1+G)**(TIME(T)-1);
TAXB.L(T)=      TAXB0      *(1+G)**(TIME(T)-1);
TAXC.L(T)=      TAXC0      *(1+G)**(TIME(T)-1);
TAXD.L(T)=      TAXD0      *(1+G)**(TIME(T)-1);
TAXE.L(T)=      TAXE0      *(1+G)**(TIME(T)-1);
TAXF.L(T)=      TAXF0      *(1+G)**(TIME(T)-1);
TAX.L(T)=       TAX0      *(1+G)**(TIME(T)-1);
GK.L(I,T)=      GK0(I)    *(1+G)**(TIME(T)-1);
SAVG.L(T)=      SAVG0     *(1+G)**(TIME(T)-1);
RK.L(I,T)=      RK0(I)    *(1+G)**(TIME(T)-1);
KF.L(I,T)=      KF0(I)    *(1+G)**(TIME(T)-1);
JK.L(I,T)=      JK0(I)    *(1+G)**(TIME(T)-1);
ID.L(I,T)=      ID0(I)    *(1+G)**(TIME(T)-1);
IDT.L(I,T)=     IDT0(I)   *(1+G)**(TIME(T)-1);
IK.L(I,T)=      IK0(I)    *(1+G)**(TIME(T)-1);
JKTOT.L(T)=     JKTOT0    *(1+G)**(TIME(T)-1);
THETA.L(I,T)=  THETA0(I)*(1+G)**(TIME(T)-1);
TXC.L(I,T)=      TXC0(I)    *(1+G)**(TIME(T)-1);
TXG.L(I,T)=      TXG0(I)    *(1+G)**(TIME(T)-1);
TXI.L(I,T)=      TXI0(I)    *(1+G)**(TIME(T)-1);
TMC.L(I,T)=     TMC0(I)   *(1+G)**(TIME(T)-1);
TMK.L(I,T)=     TMK0(I)   *(1+G)**(TIME(T)-1);
TMN.L(I,T)=     TMN0(I)   *(1+G)**(TIME(T)-1);
TY.L(K,T)=      TY0(K)    *(1+G)**(TIME(T)-1);
TE.L(I,T)=      TE0(I)              *(1+G)**(TIME(T)-1);
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 TS.L(I,T)=     TS0(I)    *(1+G)**(TIME(T)-1);
 TC.L(I,T)=     TC0(I)    *(1+G)**(TIME(T)-1);
 INV.L(T)=      INV0      *(1+G)**(TIME(T)-1);
 STOT.L(T)=     STOT0     *(1+G)**(TIME(T)-1);
 B.L(T)=        B0        *(1+G)**(TIME(T)-1);
 PWMN.L(I,T)=   PWMN0(I)  *(1+G)**(TIME(T)-1);
 PWMC.L(I,T)=   PWMC0(I)  *(1+G)**(TIME(T)-1);
 PWMK.L(I,T)=   PWMK0(I)  *(1+G)**(TIME(T)-1);
 PWE.L(I,T)=    PWE0(I)   *(1+G)**(TIME(T)-1);
 OBJ.L       =0;
 REMIT.L(K,T)=  REMIT0(K)*(1+G)**(TIME(T)-1);
 GTRANSF.L(T)=  GTRANSF0 *(1+G)**(TIME(T)-1);
 GTRS.L(K,T)=   GTRS0(K) *(1+G)**(TIME(T)-1);
 SHAREDX.L(T)=  SHAREDX0 *(1+G)**(TIME(T)-1);
 DEBT.L(T)=     DEBT0     *(1+G)**(TIME(T)-1);
 RWI.L(T)=      RWI0      *(1+G)**(TIME(T)-1);
 NECPOB.L(N,YY,T)  = NECPOB0(N,YY);

*---- RESTRICTIONS OF VARIABLE VALUES
 PQ.LO(I,T)=0.001;
 PD.LO(I,T)=0.001;
 PC.LO(I,T)=0.001;
 PN.LO(N,T)=0.001;
 PK.LO(I,T)=0.001;
 PKK.LO(I,T)=0.001;
 XQ.LO(I,T)=10;
 E.LO(I,T)=10;
 PMC.LO(I,T)=0.001;
 PMK.LO(I,T)=0.001;
 PMN.LO(I,T)=0.001;
 PE.LO(I,T)=0.001;
 P.LO(I,T)=0.001;
 IPC.LO(T)=0.001;
 X.LO(I,T)=1;
 MC.LO(I,T)=0.01;
 MN.LO(I,T)=0.01;
 MK.LO(I,T)=0.01;
 D.LO(I,T)=1;
 PV.LO(I,T)=0.0001;
 ER.LO(T)=1;
 WL.LO(I,T)=0.00001;
 WA.LO(T)  =0.00001;
 L.LO(I,T)=0.0001;
 DES.LO(T)=0.0000;
 DI.LO(I,T)=0.00000001;
 C.LO(N,K,T)=0.000;
 CB.LO(I,T)=0.000;
 Y.LO(K,T)=10;
 YH.LO(K,T)=10;
 NECPOB.LO(N,YY,T)=0;
 INV.LO(T)=0;
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 JKTOT.LO(T)=0;
 LS.LO(T)=0.000;
 TAXAC.LO(T)=0.000;
 TAXAG.LO(T)=0.000;
 TAXAI.LO(T)=0.000;
 TAXB.LO(T)=0.000;
 TAXC.LO(T)=0.000;
 TAXD.LO(T)=0.000;
 TAXE.LO(T)=0.000;
 TAXF.LO(T)=0.000;
 TAXG.LO(T)=0.000;
 TAX.LO(T)=0.0001;
 GK.LO(I,T)=0.0001;
* SAVG.LO(T)=0.0001;
 RK.LO(I,T)=0.0001;
 KF.LO(I,T)=0.0001;
* JK.LO(I,T)=0.0001;
* THETA.LO(I,T)=0.0001;
* IK.LO(I,T)=0.0001;
 PWMN.LO(I,T)=0.0001;
 PWMC.LO(I,T)=0.0001;
 PWMK.LO(I,T)=0.0001;
 PWE.LO(I,T)=0.0001;
* REMIT.LO(K,T)=0.0001;
* GTRANSF.LO(T)=0.0001;
* GTRS.LO(K,T)=0.0001;
* SHAREDX.LO(T)=0.0001;
* DEBT.LO(T)=0.0001;
* RWI.LO(T)=0.00;
* ID.LO(I,T)=0.001;
* IDT.LO(I,T)=0.001;

* MODEL CLOSURE
* Variables to be fixed


  sharedx.fx(t)=sharedx0;


  TS.FX(I,T)=TS0(I);

* Simulation for tariff changes

* TMC.FX(I,T)=TMC0(I);

  TMC.FX("RT","1994")=TMC0("RT");
  TMC.FX("RT","1995")=0.95*TMC.L("RT","1994");
  TMC.FX("RT","1996")=0.90*TMC.L("RT","1995");
  TMC.FX("RT","1997")=0.85*TMC.L("RT","1996");
  TMC.FX("RT","1998")=0.80*TMC.L("RT","1997");
```

```
TMC.FX("RT","1999")=0.75*TMC.L("RT","1998");
  TMC.FX("RT","2000")=0.70*TMC.L("RT","1999");
  TMC.FX("RT","2001")=TMC.L("RT","2000");
  TMC.FX("RT","2002")=TMC.L("RT","2001");
  TMC.FX("RT","2003")=TMC.L("RT","2002");
  TMC.FX("RT","2004")=TMC.L("RT","2003");
  TMC.FX("RT","2005")=TMC.L("RT","2004");

  TMC.FX("AGG","1994")=TMC0("AGG");
  TMC.FX("AGG","1995")=1.25*TMC.L("AGG","1994");
  TMC.FX("AGG","1996")=1.20*TMC.L("AGG","1995");
  TMC.FX("AGG","1997")=1.15*TMC.L("AGG","1996");
  TMC.FX("AGG","1998")=1.10*TMC.L("AGG","1997");
  TMC.FX("AGG","1999")=1.05*TMC.L("AGG","1998");
  TMC.FX("AGG","2000")=TMC.L("AGG","1999");
  TMC.FX("AGG","2001")=TMC.L("AGG","2000");
  TMC.FX("AGG","2002")=TMC.L("AGG","2001");
  TMC.FX("AGG","2003")=TMC.L("AGG","2002");
  TMC.FX("AGG","2004")=TMC.L("AGG","2003");
  TMC.FX("AGG","2005")=TMC.L("AGG","2004");

* Simulation for tariff changes

* TMK.FX(I,T)=TMK0(I);

  TMK.FX(I,"1994")=TMK0(I);
  TMK.FX(I,"1995")=0.95*TMK.L(I,"1994");
  TMK.FX(I,"1996")=0.90*TMK.L(I,"1995");
  TMK.FX(I,"1997")=0.85*TMK.L(I,"1996");
  TMK.FX(I,"1998")=0.80*TMK.L(I,"1997");
  TMK.FX(I,"1999")=0.75*TMK.L(I,"1998");
  TMK.FX(I,"2000")=0.70*TMK.L(I,"1999");
  TMK.FX(I,"2001")=TMK.L(I,"2000");
  TMK.FX(I,"2002")=TMK.L(I,"2001");
  TMK.FX(I,"2003")=TMK.L(I,"2002");
  TMK.FX(I,"2004")=TMK.L(I,"2003");
  TMK.FX(I,"2005")=TMK.L(I,"2004");


   •  Simulation for tariff changes
   •
* TMN.FX(I,T)=TMN0(I);

  TMN.FX(I,"1994")=TMN0(I);
  TMN.FX(I,"1995")=0.95*TMN.L(I,"1994");
  TMN.FX(I,"1996")=0.90*TMN.L(I,"1995");
  TMN.FX(I,"1997")=0.85*TMN.L(I,"1996");
  TMN.FX(I,"1998")=0.80*TMN.L(I,"1997");
  TMN.FX(I,"1999")=0.75*TMN.L(I,"1998");
  TMN.FX(I,"2000")=0.70*TMN.L(I,"1999");
```

```
  TMN.FX(I,"2001")=TMN.L(I,"2000");
  TMN.FX(I,"2002")=TMN.L(I,"2001");
  TMN.FX(I,"2003")=TMN.L(I,"2002");
  TMN.FX(I,"2004")=TMN.L(I,"2003");
  TMN.FX(I,"2005")=TMN.L(I,"2004");

  TE.FX(I,T)=TE0(I);

  TC.FX(I,T)=TC0(I);

*Simulation of consumption tax changes

  TXC.FX("AGG",T)=TXC0("AGG");

  TXC.FX("RT","1994")=TXC0("RT");
  TXC.FX("RT","1995")=1.2*TXC.L("RT","1994");
  TXC.FX("RT","1996")=1.15*TXC.L("RT","1995");
  TXC.FX("RT","1997")=1.15*TXC.L("RT","1996");
  TXC.FX("RT","1998")=1.1*TXC.L("RT","1997");
  TXC.FX("RT","1999")=1.1*TXC.L("RT","1998");
  TXC.FX("RT","2000")=TXC.L("RT","1999");
  TXC.FX("RT","2001")=TXC.L("RT","2000");
  TXC.FX("RT","2002")=TXC.L("RT","2001");
  TXC.FX("RT","2003")=TXC.L("RT","2002");
  TXC.FX("RT","2004")=TXC.L("RT","2003");
  TXC.FX("RT","2005")=TXC.L("RT","2004");

  TXG.FX(I,T)=TXG0(I);

  TXI.FX(I,T)=TXI0(I);

*Simulation of income tax

  TY.FX(K,T)=TY0(K);

* TY.FX(K,"1995")=TY0(K);
* TY.FX(K,"1996")=TY0(K);
* TY.FX(K,"1997")=TY0(K);
* TY.FX(K,"1998")=TY0(K);
* TY.FX(K,"1999")=TY0(K);
* TY.FX(K,"2000")=TY0(K);
* TY.FX(K,"2001")=TY0(K);
* TY.FX(K,"2002")=TY0(K);
* TY.FX(K,"2003")=TY0(K);
* TY.FX(K,"2004")=TY0(K);
* TY.FX(K,"2005")=TY0(K);


*Simulation of international price changes

  PWE.FX(I,T)=PWE0(I);
```

```
  PWMN.FX(I,T)=PWMN0(I);
  PWMC.FX(I,T)=PWMC0(I);
  PWMK.FX(I,T)=PWMK0(I);

* B.FX(T)=B0;

*Simulation of devaluation

* ER.FX(T)=ER0;

  ER.FX("1994")=ER0;
  ER.FX("1995")=1.09*ER.L("1994");
  ER.FX("1996")=1.06*ER.L("1995");
  ER.FX("1997")=1.05*ER.L("1996");
  ER.FX("1998")=1.04*ER.L("1997");
  ER.FX("1999")=ER.L("1998");
  ER.FX("2000")=ER.L("1999");
  ER.FX("2001")=ER.L("2000");
  ER.FX("2002")=ER.L("2001");
  ER.FX("2003")=ER.L("2002");
  ER.FX("2004")=ER.L("2003");
  ER.FX("2005")=ER.L("2004");

  WA.FX(T) =WA0;

*Simulation on public spending changes

*  GK.FX(I,T)=GK0(I);

  GK.FX("RT","1994")=GK0("RT");
  GK.FX("RT","1995")=0.95*GK.L("RT","1994");
  GK.FX("RT","1996")=0.95*GK.L("RT","1995");
  GK.FX("RT","1997")=0.95*GK.L("RT","1996");
  GK.FX("RT","1998")=0.95*GK.L("RT","1997");
  GK.FX("RT","1999")=0.95*GK.L("RT","1998");
  GK.FX("RT","2000")=GK.L("RT","1999");
  GK.FX("RT","2001")=GK.L("RT","2000");
  GK.FX("RT","2002")=GK.L("RT","2001");
  GK.FX("RT","2003")=GK.L("RT","2002");
  GK.FX("RT","2004")=GK.L("RT","2003");
  GK.FX("RT","2005")=GK.L("RT","2004");

  GK.FX("AGG","1994")=GK0("AGG");
  GK.FX("AGG","1995")=1.1*GK.L("AGG","1994");
  GK.FX("AGG","1996")=1.05*GK.L("AGG","1995");
  GK.FX("AGG","1997")=1.05*GK.L("AGG","1996");
  GK.FX("AGG","1998")=GK.L("AGG","1997");
  GK.FX("AGG","1999")=GK.L("AGG","1998");
  GK.FX("AGG","2000")=GK.L("AGG","1999");
  GK.FX("AGG","2001")=GK.L("AGG","2000");
```

```
GK.FX("AGG","2002")=GK.L("AGG","2001");
  GK.FX("AGG","2003")=GK.L("AGG","2002");
  GK.FX("AGG","2004")=GK.L("AGG","2003");
  GK.FX("AGG","2005")=GK.L("AGG","2004");

* KF.FX(I,T)=KF0(I);

  JKTOT.FX(T)=JKTOT0;

  RWI.FX(T)=RWI0;

  REMIT.FX(K,T)=REMIT0(K);

  GTRANSF.FX(T)=GTRANSF0;

  GTRS.FX(K,T)=GTRS0(K);


* CALIBRATION OF VARIABLES FOR THE PERIOD 2
  KF.L(I,"1996")  = KF0(I)*(1-KDGR(I))+IK0(I);
  DEBT.L("1996")  = DEBT0 + B0;
* Intructiones to solve the model

  OPTIONS ITERLIM=100000,LIMROW=5,LIMCOL=0 ;
  MODEL UNO / ALL / ;

* Verification of Walras law

  PARAMETER
  PERIOD
  CHEQUEO
  CHEQUEO2;

* Determines the simulation period
  PERIODO=2;
  TT(T) = YES $ (ORD(T) EQ PERIODO);
* Se fijan variables calculadas previamente con T+1
    KF.FX(I,T)$TT(T) = KF.L(I,T);
    DEBT.FX(T)$TT(T) = DEBT.L(T);

 SOLVE UNO MAXIMIZING OBJ USING NLP;

 CHEQUEO= sum(tt, SUM(I, PWMN.L(I,TT)*MN.L(I,TT))
           + SUM(I, PWMC.L(I,TT)*MC.L(I,TT))
           + SUM(I, PWMK.L(I,TT)*MK.L(I,TT)) + RWI.L(TT)*DEBT.L(TT)
           - SUM(I, PWE.L(I,TT)*E.L(I,TT))
           - SUM(K,REMIT.L(K,TT))
           - GTRANSF.L(TT)- B.L(TT));


  CHEQUEO2= SUM(TT, INV.L(TT)-     STOT.L(TT));
```

```
  DISPLAY   CHEQUEO, CHEQUEO2;

*::::::::Defines and makes an accounting matrix

 SET ISAM   Categories       /Agrico
                              Resto
                              Agricob
                              Restob
                              Tot
                              Totb
                              Familias
                              Sueldos
                              Ganancias
                              Transf
                              Gobierno
                              Impind
                              Impdir
                              Transg
                              Capital
                              Ahorro
                              Depre
                              S-Externo
                              Bienyserv
                              Pagosfact
                              Transx
                              Total /

    ISAM1(ISAM)              /Total/
    ISAM2(ISAM)  ;

 ALIAS (ISAM2, ISAM3) ;

 PARAMETER SAM(T,ISAM, ISAM) ;

 ISAM2(ISAM) = NOT ISAM1(ISAM)  ;


$INCLUDE 2420d.gms
$INCLUDE 2420t.GMS
$INCLUDE 2420t.gms
$INCLUDE 2420t.GMS
$INCLUDE 2420t.gms
$INCLUDE 2420t.GMS
$INCLUDE OUT2420.GMS
```

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